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Public Health in Tudor England*

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IN studying the development of public health activities in 16th century England, we find that it runs parallel with and, in fact, is contingent upon the growth of a strong, centralized government under the Tudors. The attitude of the State, especially in the reign of that amazing ruler, Elizabeth, was an enlightened one, seeking to guard and foster the welfare of all of the people. We are apt to forget today that in Elizabeth's time government regulation of industry and of many phases of the life of the people was the accepted order. It is significant that from such a philosophy of government sprang many of our basic public health procedures.

Manifestations of this ideal are seen in the various efforts to better the sanitary and health conditions of the people, not only in attempting to control epidemics, but in aiming also to eradicate some of the fundamental factors in the cause and spread of disease. Housing plans were proposed to relieve the overcrowding of cities, pure food laws were passed, rules made to keep the streets clean, and a commission appointed to regulate the disposal of sewage. All of these projects had the definite purpose of protecting and improving the health of the populace.

A Commission on Sewers had been established as early as the 15th century by Henry VI. It provided severe penalties for the pollution of streams, and these were enforced. Tanners and brewers were required to drain their waste into cesspools. Owners of swine had to provide suitable accommodations for their animals, and to take special precautions that there should be no drainage from the sties into neighboring streams. In connection with animals it is interesting to see that Henry VII recognized the menace to health from slaughterhouses and passed a law forbidding them within cities or towns, "leste it might engendre sicknes, unto the destruction of the people."

For many years there had been a statute that any one throwing dung or offal into the streets would be fined 40 shillings, a considerable sum in those days, and there is abundant evidence that this was enforced. At first the task of sweeping the streets was left to the householder, but later it became a municipal function and men were hired

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by the towns and cities for the purpose. The unsanitary conditions of streets was considered an important factor in plague epidemics, and rules for cleaning streets are embodied in the Plague Orders.

It was realized that pure and wholesome food was essential to health. As Elizabeth stated in a proclamation: "We must provide . . . foode, and other like necessaries for mans life upon reasonable prices, without which no citie can long continue," and, as another proclamation says, "food should be good, sweete, sound, and wholesome for mans body." The standards and quality of food products were regulated by various laws, such as the *Assize of Bread*. The government proceeded strenuously against anyone selling bad or tainted food, and in one case the punishment certainly fitted the crime: any dealer who sold bad pork was to be put in the pillory in the market place and the rancid flesh burned in his face. The problem of adequate food supply in times of dearth was a serious one, and in 1577 John Dee, Queen Elizabeth's physician, suggested that the government establish stores of grain to meet such emergencies. This was done in a small way by various municipalities, and in 1623 James I carried it out on a large scale. One of the reasons he gives for his action will strike a sympathetic note today. He says: "The Kings most Excellent Majestie, observing that in times of dearth His loving Subjects (especially the poorer sort) are pinched with the great want and deere prices of Corne, and that the Treasure of the Kingdome, in those times is much exhausted, in providing Corne from forraine parts, and againe, that in times of plenty, the Farmour and Husbandman, by the low prices, and want of vent of their Corne, are hardly able to support their necessary charge nor the Landlord to uphold his rent." He hopes to stabilize prices by gathering stores in various parts of the kingdom, where, in times of famine, corn will be sold at a fixed fair price.

The rapidly increasing population of London was a cause of great concern to the government, as it realized the dangers from disease in such a congested area. As Elizabeth herself put it, in a proclamation of 1580 against tenements: "Yet where there are such great multitudes of people brought to inhabitate in small roomes, whereof a great part are seene very poore, Yea, such as must live of begging, or by worse meanes, and they heaped up together, and in a sort smothered with many families of children and servantes in one house or small tenement, it must needes followe (if any plague or popular sicknes shoulde by Gods permission, enter amongst those multitudes) that the same would not only spread it selfe and invade the whole city and confines, as great mortalitie should ensue to the same." The aim of this law was to prohibit any new buildings within the city area, or the subdivision of existing houses into tenements.

Elizabeth's Stuart successors attempted to further these plans, but they met with vigorous opposition from selfish private interests, who put their own gain before the health of the community. Both James I and Charles I had very extensive schemes for city planning, regulating all phases of building. Among the proposals of Charles was this—"The windowes of every whole story to be of more height than breadth to the end the Roomes may receive ayre for health." In light of the recent survey of the present living conditions of the London poor, emphasizing the fact that large numbers still inhabit ill-lighted and unsanitary basement rooms, it is amazing to find that this law of Charles I prohibited cellars being used as lodgings. It is a sad commentary upon civilization that such far seeing plans were discarded under the *laissez faire* system.

However, the general efforts of Elizabeth did much to improve conditions, probably more effectively in the towns than in London itself, and I think it should be emphasized that the sanitary conditions of 16th century England were much better than we usually have been led to believe. J. H. Thomas, in an important recent work, "*Town Government in the Sixteenth Century*," has made a study of all phases of sanitation of some 12 English towns, and he says, "If a wider knowledge of town life as revealed by town *Records* refutes the view that towns remained filthy and entirely neglected by ignorant and irresponsible authorities, so must a fuller acquaintance with the little that is known about the origin of the diseases of the 16th century modify the opinion that town conditions caused those diseases." He compared the state of these towns in the 16th century with that in the middle of the 19th century, as revealed in the Royal Commission Survey of 1844–1845, and comes to the conclusion that in almost every respect the towns were cleaner and more healthy in the 16th century than they were in the 19th century. He says, "If some period in town life must be labelled as a time of in-sanitation, then the 19th century should be chosen."

One of the most important public health activities of the government was the control of epidemics. From the early part of the century the medical profession played a prominent part in this endeavor, through the College of Physicians. This had been founded in 1518 by Henry VIII on the advice of his physician, Thomas Linacre, and it is significant that from that very year date some of the most important public health measures, put into effect by the Privy Council, such as the isolation and marking of houses infected with plague, the isolation of clothes and goods of those dying of the plague, the first London Plague Orders, and the first time Bills of Mortality are mentioned.

Considerable powers in matters of health were delegated to the College of Phyisicians, and also to the Barber-Surgeons Company, founded in 1540. Thus the College of Physicians had charge of the licensing of doctors in London and sought to curb the quacks and charlatans who preyed on the public. Since there was no such authority outside of London, a prominent physician, John Securis, suggested a strict licensing law for all physicians, surgeons, and apothecaries, on the basis of educational qualifications. On the advice of the College of Physicians, the apothecaries were taken out of the Grocers Company and set up as a separate company. From the appearance of most modern drug stores they seem to have gone back again. The apothecaries were required to adhere to the official *Pharmacopoeia* drawn up by the College. The proclamation ordering this move says it was done "out of Our Royall care for the health and preservation of our Subjects."

For control of the plague there were two sets of *Orders*, those for London and those for the country at large. In general, the provisions of these were much the same, although the organization differed. In London the Lord Mayor and the Aldermen were in charge, while in rural communities the Justices of Peace of a county, except those from infected areas, were to meet together, prescribe rules for the isolation of infected towns, and to put into effect the orders outlined by the government. The next provision in both of these *Orders* was a very necessary one, the raising of funds by taxation to meet the costs of the campaign. The government accepted the responsibility of relief in such a crisis. The money thus raised was to be used not only in general measures, but as the *Orders* themselves say "for the finding of victuall, or fire, or medicines for the poorer sort, during

the time of their restraint." Men were to be hired to examine all suspected patients in order to isolate all those infected and to obtain an estimate of the extent of the epidemic. The ministers, curates, and church wardens were to certify in writing the number of infected, and also of those dying within their parishes, with the probable cause of death. These findings were elaborated into the weekly and yearly Bills of Mortality. As such Bills apparently were used first in England, they mark the beginning of vital statistics.

Every house that contained one stricken with this dread disease was to be marked with a cross and the words "Lord have mercy upon us." Attempts were made to localize the epidemic and any infected person going abroad was treated as a felon. There were efforts made throughout the country to segregate plague patients in isolation hospitals. Sometimes these were rather makeshift dwellings outside the towns, but in 1592 a pesthouse was established in London.

Assemblies of people such as plays, bear-baitings, and fairs were forbidden. Sometimes the schools were closed. Preparations were made for the burial of the dead in a place apart. The clothes, bedding, and other goods of those dying or recovering from plague were usually burned, and the owner recompensed from the general funds.

At the end of the general *Orders* is a collection of remedies, "by the best learned in Physicke within this Realme . . . without charge to the meaner sort of people." The wealthy could afford to pay the doctor who cared for them during the plague, but poor people could not and the government provided such service. In 1583, in a translation of Ewich's *Of the Duetie of a Faithfull and Wise Magistrate*, it was suggested that the commonwealth hire physicians, surgeons, and apothecaries to deal with plague patients. While this had been done sporadically, finally the College of Physicians put it into permanent practice, thus bringing into being the first Public Health Physician. These men were bound by oath to remain at their posts, and many died of plague. That their services were appreciated is shown by the provision for pensions to the widows of such doctors.

It would seem that everything humanly possible was done to combat the disease, along the lines of control measures. In spite of these efforts the plague continued its ravages, and in the more severe epidemics, as in 1603 and 1625, in each of which over one-sixth of the population died, the public became panic-stricken, and the system broke down. The rules could not be enforced, the dead were left unburied, and each one looked out for himself.

An element in increasing this state of panic was the teaching of certain religious fanatics that the plague was a sign of the wrath of God, that it was not infectious, and that to attempt to avoid it was an indication of a lack of faith in God. The government took a firm stand in this matter, and in the *Orders* there is a section forbidding persons "to utter such dangerous opinions upon payne of imprisonment." A number of preachers were thrown into jail for continuing to spread such doctrines.

The important lesson that may be learned from this experience of the past is the part that human frailty plays in the struggle against disease. Ignorance and fear can upset the most logical plan, and we have seen that when government became weak and lost its control, all the admirable efforts in housing and pure food regulations were sacrificed to selfish greed. Education can do much to overcome ignorance but also there must be courageous and strong leadership and a determined social-consciousness of the public.

Responsibilities of Health Authorities to Prevent the Spread of Syphilis*

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IT is our responsibility to stop the spread of syphilis wherever a barrier can be erected in its path. The logical position for the first barrier is in the field of prophylaxis. At the beginning of the present century Metchnikoff and Roux discovered and demonstrated beyond the possibility of doubt that the spirochete of syphilis may be killed upon the surface of the mucous membrane. Successful application of this discovery was made during the world war by the British Army which distributed prophylactic packets for self-disinfection and by the American Army which established centers for skilled disinfection. But neither of these systems has achieved any large measure of success in a civilian population. An English Committee of Enquiry on Venereal Diseases set up in 1923 reported: (1) that skillfully applied disinfection after intercourse would often prevent infection, (2) the success of any general public facilities for self disinfection is likely to be small, (3) that they could find no reason why people should not be allowed to purchase disinfectants for their own use and, therefore, (4) that the English law should be altered "so as to permit properly qualified chemists to sell *ad hoc* disinfectants, provided that such disinfectants are sold in a form and with instructions for use approved by some competent authority."

During the last ten years no competent authority has been found willing to sponsor a set of instructions. Dr. Taliaferro Clark [1] reported for this country in 1931 that "in the states and cities in which prophylactic stations have been established they have been so poorly patronized that they have been given up." It still remains true that an ointment containing 33 per cent of calomel will, if thoroughly applied to the exposed surface within a few hours of exposure, prevent syphilitic infection. It should be applied if possible within 1 hour and in any case within 8 hours. I confess that the only use that I have made of this knowledge has been to urge upon certain of my audieces that if ever they find themselves in a position where they may have been exposed to infection they shall without delay, be it day or night, apply to a physician for prophylactic treatment. I hope that some of them have done so and that the physicians have received them cordially. My hope, however, is not very stout.

Treatment of contagious syphilis with arsphenamine or even with bismuth

* Read at a Joint Session of the American Social Hygiene Association and the Public Health Nursing Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 3, 1934.

rapidly renders it non-contagious. This fact provides us with our second barrier; indeed, with our Hindenburg Line. For if we fail at this barrier we shall lose the war.

The provision of free treatment in accessible and attractive clinics has been the main element in the British campaign against venereal disease since the war. Colonel Harrison [2] offers statistical evidence that there has been a slight decrease of syphilis in England and Wales. That the English scheme has failed to "eradicate" syphilis Colonel Harrison freely admits, and it will be profitable for us to examine the four main causes which, in his opinion, explain the failure: "(1) The inability of many of the infected to remain continent until pronounced cured. (2) The large numbers of persons who cease attendance too soon. (3) The imperfection of treatment centers. (4) The ignorance of many persons in the community that they are infected."

We need not perhaps take the first cause too seriously. Fortunately it is not necessary for the patient to remain continent during a 2 year course of treatment. It is possible for him or her to remain continent until no longer contagious. The second and third causes are removable, not without effort, and the fourth cause leads directly to another responsibility of health authorities which we must consider.

Before doing so let us note that in the rural districts and smaller towns of the United States treatment centers are not at all likely to succeed while the bulk of the organized medical profession is opposed to them. In England the situation is entirely changed by the operation of the National Health Insurance Act. Similar legislation would change the situation here, but until we have health insurance we must rely on the private treatment of a majority of our cases. This is a further handicap because it means that we have to persuade every practising physician to persuade each of his patients that inadequate treatment is more dangerous than no treatment at all. We must also exert ourselves that the practising physician be supplied with free drugs and at least a minimum fee from the public treasury; for he can hardly be expected to be enthusiastic in prolonging treatment when he has to bear all the expense thereof himself.

I have said that the ignorance of many people of the fact that they are infected leads us to another responsibility. We are responsible for making the discovery. We must find our cases of syphilis and find them early. We face no responsibility more urgent than this.

First we have the Wassermann test and the various other serological tests for syphilis. "The Utopian day has not yet come," says Dr. Moore [3] "when every patient who consults a physician, for whatever cause, can have made a routine diagnostic blood Wassermann test. There are two types of patients, however, in whom the test should be made an absolute routine: (1) any patient in whom, for any reason, a general medical examination is made; (2) every pregnant woman."

Our recent survey experience in New Mexico has brought fresh evidence of the case finding possibilities of the routine Wassermann. A survey of a random sample of the population shows that we have some 21,000 cases of syphilis among the adults of the state. A census of all cases under treatment in the state on a given day shows 1,011 under medical care. The routine application of the Wassermann test can thus declare to us in our state about 20 times the number of cases that are actually known to us. When we consider further that almost 8 per cent of our adult population give positive reactions to the test (the percentage is higher in the cities, lower in the rural districts)

it must be obvious that it would be profitable to the doctors to avail themselves freely of this test. It is true that from the public health viewpoint many cases so discovered have passed the contagious stage.

In applying the test to pregnant women we are, on the other hand, sure that most positive cases will be both contagious and in the act of passing on the contagion. The study of 1,467 pregnancies in women with latent syphilis collected by the Coöperative Clinical Group shows that a syphilitic woman, untreated, has only 1 chance in 6 of bearing a live healthy infant, as compared with the normal woman's 3 chances in 4.[4] We must therefore make the Wassermann test an integral part of every prenatal program.

I believe that the women's clubs should be made to share our responsibility in this respect. In addressing such organizations I have insisted that if their members, the most respectable members of the community, will insist on being given a Wassermann test each time that they become pregnant, then the obstetricians in that community will very soon make the test a matter of routine.

Other speakers will discuss in detail the methods of case finding. I am glad because I feel that this subject forms a fitting climax to this symposium. Let me say that I consider that Smith and Brumfield[5] have completely proved their case that "it is practical to trace sources of infection and exposures in syphilis." On only two occasions did they find patients unwilling to name their consorts. The young people of this generation are ready to tell us. I am doubtful whether the doctors are equally ready to ask, although I agree with Dr. Smith that if the private physician will accept this responsibility nobody is better equipped to carry it through. H. W. Cummings[6] has suggested that health authorities should provide social workers to work with private practitioners as well as clinics in case finding. I would rather provide public health nurses who are, I believe, in a more strategic position than social workers.

I do not expect you to disagree with anything I have said up to this point. Now, however, I broach a questionable responsibility about which there is bound to be difference of opinion. People are always ready to quarrel on a subject about which they feel deeply, and people are always liable to feel more deeply, on a subject the less they know about it.

I approach the subject of sexual mores. To what extent is the incidence of syphilis determined by different kinds of sex behavior? To what extent, and by what methods can sex behavior be modified?

If you will look at the chart reproduced from the *Journal of Social Hygiene* for January, 1933, you will perceive that two individuals are especially responsible for the spread of syphilis in this little epidemic. The first is a prostitute, the second is a man of promiscuous sexual habits. This chart represents as good evidence as you will find that these two types of sex behavior tend toward the spread of syphilis.

Assuming for the moment that it is our responsibility to offer combat to prostitution and to promiscuity, there are two weapons offered to our hands: law and education. Let us examine the possibilities of each of these weapons in relation to each of these presumably undesirable social customs.

Historically the first method tried on the prostitute after the introduction of syphilis into Europe was abolition. An order of the town council of Aberdeen, Scotland, quoted by Taliaferro Clark[1] reads:

> For the protection from a disease which came out of France and strange parts, all light women desist from their vice and sin of

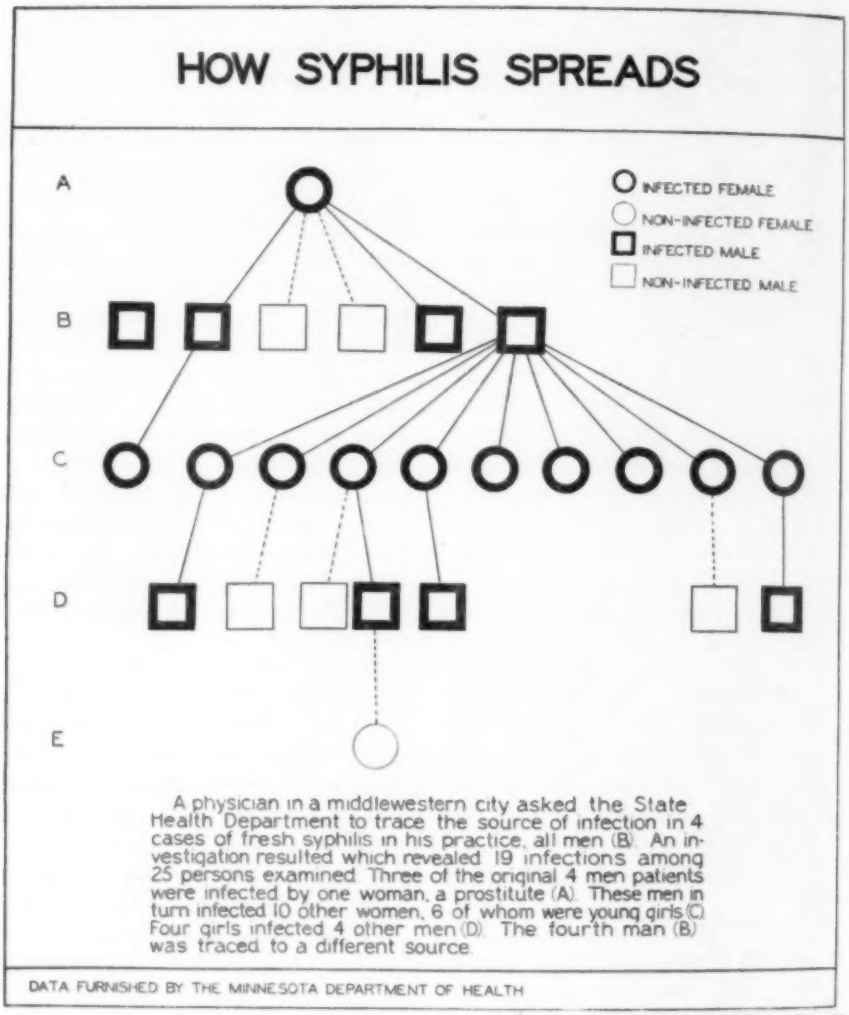
HOW SYPHILIS SPREADS
A
B
C
D
E
INFECTED FEMALE
NON-INFECTED FEMALE
INFECTED MALE
NON-INFECTED MALE
A physician in a middlewestern city asked the State Health Department to trace the source of infection in 4 cases of fresh syphilis in his practice, all men (B). An investigation resulted which revealed 19 infections among 25 persons examined. Three of the original 4 men patients were infected by one woman, a prostitute (A). These men in turn infected 10 other women, 6 of whom were young girls (C). Four girls infected 4 other men (D). The fourth man (B) was traced to a different source.
DATA FURNISHED BY THE MINNESOTA DEPARTMENT OF HEALTH

Chart by A.S.H.A., New York

venery and work for their support on pain lese of being branded with a hot iron on their cheek and banished from the town.

Nevertheless the light women did not desist from their vice and sin of venery.

Next an attempt was made to regulate the same vice with the object of isolating prostitutes from the general population and removing from the traffic those who were infected. Commonly but not universally it is agreed that "regulation" is a failure. In a recent review of the subject, Colonel Harrison [7] maintains that in certain circumstances regulation of prostitution can be effectual. Regulation proved successful under his direction when he abandoned all attempts to isolate infected women, assumed all prostitutes to be infected, and concentrated on measures designed to prevent the spread of contagion.

However, whether or not it is successful, regulation will always be opposed in countries with an Anglo Saxon tradition by those who reflect—

How oft the sight of means to do ill deeds
Makes ill deeds done.

The same Anglo Saxon tradition lends power to those modern health officers who have reverted to the method of the Aberdeen fathers. Of course police methods have been improved since the days of branding cheeks. One of our fellow authorities kept, and for all I know still keeps, a group of under-cover agents [8] who live by double-crossing their friends in the trade. Under this system both prostitutes and police may well feel uneasy, and it is not difficult to accept the claim that "the whole procedure has worked a very severe hardship on the prostitution underworld." What one would like to know is whether this and similar repressive measures have decreased the incidence of syphilis. Being unable to answer this question I turned for help to the American Social Hygiene Association, and Mr. Johnson came very kindly to my rescue. He sent me a reprint of an article published some years ago [9] in which he had marked the following paragraph:

> Municipal policy toward prostitution has tended toward regulation and certain conditions have prevailed which are generally believed to have venereal diseases as an accompaniment. No statistical evidence has ever been available to show whether there was more or less infection under such a policy and under such conditions.

Mr. Johnson comments that "this situation still exists." What we did not know in 1927 we still do not know in 1934. Our first responsibility is perhaps to find out what effect legal repression of prostitution has on the incidence of syphilis and then to act in the light of our knowledge.

Before taking any action of this kind, however, do let us consider what effect it is going to have on our attempts to trace the transmission of syphilis from case to case.

Laws are also available for the punishment of those guilty of promiscuous sexual relations. More than that, laws have been seriously recommended which provide a 6 months jail sentence for any extra-marital sexual relations whatever. The enforcement of such laws would certainly stamp out venereal disease. But does anyone imagine that they could be enforced? Col. P. M. Ashburn [10] reported in 1927 that 54 per cent of 550 West Point students, ages 21 to 27 years, had had sex intercourse on an average of 23 times.

And again, if we make ourselves responsible for the enforcement of such laws, shall we be able to trace from case to case the transmission of syphilis. "Young man" we shall say, "if you will give me the names of all the girls with whom you have had any sex relations I shall, of course, have to see that they are sent to prison for 6 months, but I shall also see that the disease is thoroughly treated."

And once more, what do we really know of the influence of sex behavior on the incidence of syphilis?

Two years ago I had to address a group of sociologists. The above subject appeared to me one on which we might find common ground. In seeking material on which to base a discussion of this subject I was astonished as well as disappointed with the absence from sociological literature of any exact observations on the relationship between social behavior and the spread of the venereal diseases. I should have thought that sociologists would have been doubly interested in making such observations. In the first place a relationship having been established, objective records of pathology might be used as a clue to the sex-social organization of a given society. In the second place, the contribution of venereal disease to family disorganization and racial decay must surely be a matter of importance to sociologists. I take as an example the work of Rivers [11] among the Todas of British India. He writes:

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There seems to be no doubt that there is little restriction of any kind on sexual intercourse . . . instead of adultery being regarded as immoral, I rather suspected, though I could not satisfy myself on the point, that according to the Toda idea, immorality attaches rather to the man who grudges his wife to another. . . .

So far as I could tell, the laxity in sexual matters is equally great before and after marriage.

Here then we find in practice the kind of sexual behavior at present advocated by Dora and Bertrand Russell. Would it not be of exceptional interest to know something about the incidence of venereal disease in such a community? But not a single observation bearing on this subject can I find.

With other similar studies I had practically the same experience. Malinowski [12] in a two volume report on the Trobriand islanders mentions incidentally one epidemic of acute gonorrhea which was useful to his study, but gives no other clue as to the incidence of venereal disease among these peoples to whom adolescent promiscuity appears as normal and proper recreation.

My paper grows too long and I have as yet said nothing about education as a method of controlling sex behavior. Those most familiar with my checkered past will know me as an ardent advocate of sex education. But more and more I wish to dissociate sex education from the campaign against syphilis. The object of sex education must be positive, constructive, never inhibitory. I do not want my students to feel that I am lecturing them into some accepted moral code. I want them to know that I am helping them to knowledge born of experience and experiment; that I expect them to fashion from it their own philosophy of life. The facts of venereal disease should be only a minor portion of this knowledge.

I do not deny that such education is likely to diminish the incidence of syphilis, but I do not know, and as a sex educator it is not my main concern. And I recognize, of course, that the facts about syphilis belong in the forefront of any campaign of popular health education.

SUMMARY

A knowledge of the possibilities of prophylaxis should be widespread and physicians should be prepared to give prophylactic treatment to those who ask for it.

Our main responsibility is to find cases early, to bring them under treatment, and to keep them under treatment until cured. The barrier of early and complete treatment is essential to the control of syphilis, and careful epidemiology is essential to the erection of this barrier.

Research is urgently needed on the relationship of sex-social behavior to the incidence of syphilis. Accurate morbidity statistics will greatly aid such research.

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Epidemiological Value of Isolating Bacteriophage in Outbreaks of Intestinal Infection*

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THE bacteriophage has been largely a laboratory curiosity and a subject for controversy and speculation. The principal attempt to make use of it in a practical way has been as a curative agent, upon which opinions differ. Other useful applications of the phenomenon no doubt await discovery when more information is accumulated. With the purpose of determining whether there might be any public health applications of the phenomenon, a study was begun in 1932, undertaken largely because of the success with which the isolation of bacteriophage was applied in an outbreak of bacillary dysentery in a large institution (Medfield), the main features of which are reported in a paper now in press.[1]

In this epidemic it appeared that finding a bacteriophage in the stools from those affected which was active against the bacillus causing the disease was a useful means of aiding to differentiate these cases from those due to other causes. Stool cultures had proved unreliable for 2 reasons: (1) The bacillus was soon eliminated from the intestine, and when there was delay in obtaining specimens no organism was cultivated from them; (2) Specimens had to be mailed to Boston for examination, and even stools obtained at the proper time were often negative. The epidemic had begun early in the summer in one ward. A Hiss-Y dysentery bacillus was recovered from one patient but not from others. Isolation and general sanitary measures caused an abrupt cessation of cases.

Six weeks later the infection appeared again, this time in most of the buildings of the institution. During the second outbreak over 90 stools from clinical cases were examined, and from only 6 was the dysentery bacillus obtained. At the same time 81 stools were examined for bacteriophage and 29 were found positive. The figures are more striking when divided into groups according to the week of the disease. During the first 7 days bacilli were found in 28 per cent of the specimens examined, while bacteriophage was found in 33 per cent; during the second week bacteriophage was found in 80 per cent and bacilli in 13 per cent; during the third week bacteriophage was found in 45 per cent of specimens and bacilli in none. Thereafter neither was found with any regularity. Stools of individuals not affected did not contain bacteriophage. The bacteriophages isolated in this outbreak were active against all members of the Flexner group, as well as the Sonne and Shiga bacilli.

* Read before the Laboratory Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 6, 1934.

Meanwhile an urgent necessity for finding other means of gaining information as to the etiology of outbreaks of gastroenteritis was felt. Such outbreaks are perhaps the most frequent variety that the epidemiologist is called upon to investigate, and in many instances, due to the short duration of illness, he does not arrive until the peak has passed and a majority of the cases are in the convalescent stage. Under such circumstances determniation of the etiological agent is difficult. Stool cultures are unsatisfactory because in most instances no suspicious organism is isolated. Even if one or two stools yield some organism which might be responsible, it is difficult to prove that the other cases have been caused by the same agent. Agglutination tests cannot be entirely depended upon, since some individuals may have agglutinins from previous attacks or sub-clinical exposures to the organism.

Since bacteriophage active against the invading organism has been demonstrated repeatedly in the stools of individuals suffering from illness due to various types of intestinal pathogens, it seemed that isolating bacteriophage from the stool might give some light as to the cause of an illness. Since the bacteriophage usually appears in the stool during the convalescent stage, the method would have the advantage of providing evidence long after the expectation of isolating the bacterium had passed. It was decided, therefore, to filter stools from these epidemics and set them up against a number of intestinal pathogens.

The usefulness of the procedure would depend upon several factors: (1) the chances of picking up a bacteriophage which had no relation to the outbreak; (2) the specificity of those isolated; (3) the regularity with which bacteriophages are recoverable from those ill, in contrast to those not affected.

In order to check up on the first factor, samples were collected from many sources, filtered, and placed in contact with a group of the more common intestinal bacteria. The bacteriophages isolated from these sources are summarized in Table I. It will be seen that except in sewage samples they are relatively rare. The chances of a single individual picking up a bacteriophage might be of some significance, but the chances of several individuals simultaneously picking up the same one would be quite small. That such is the case is indicated by the failure to find them in a large number of stools examined from persons involved in various outbreaks which have been studied not due to the dysentery bacillus.

When we turn to the specificy of the

TABLE I

BACTERIOPHAGES ISOLATED FROM VARIOUS SOURCES IN MASSACHUSETTS

		Bacteriophages Isolated Active Against									
Source of Specimen	*Total Specimens Examined*	*B. typhosus*	*B. paratyphosus A*	*B. paratyphosus B*	*B. dysentery (Shiga)*	*B. dysentery (Flexner)*	*B. dysentery (Hiss-Y)*	*B. dysentery (Sonne)*	*B. enteritidis*	*B. coli communis*	*Staphylococcus*
Stools *	111	6	1	0	10	9	10	6	5	2	1
Sewage	89	34	11	11	52	42	51	39	20	30	4
Rivers	116	1	0	2	6	3	10	5	0	6	4
Lakes and ponds	70	0	0	0	4	2	0	1	0	3	3
Beaches (sea water)	44	0	0	1	5	0	1	2	0	0	0
Public water supplies	7	0	0	0	1	0	2	2	0	0	0
Total	437	41	12	14	78	56	74	55	25	41	12

* None of these stools were from dysentery outbreaks.

bacteriophages we find that they can be divided into several rough groups:

1. Those active against *B. typhosus* only
2. Those active against the Flexner dysentery group
3. Those active against all dysentery bacilli, including Shiga and Sonne
4. Those active against *B. typhosus*, *B. dysenteriae* (Shiga), *B. dysenteriae*(Sonne), and *B. enteritidis*
5. Those active against all of the group of intestinal pathogens used
6. Those active against *B. coli*

Not all can be placed in the above groups as there are considerable variations in valence. No doubt mixtures of bacteriophages were dealt with in some cases, particularly from sewage samples, but repeated platings of some of wide valence (Group 5) and isolations from plaques failed to narrow the valence. Perhaps more persistent efforts will reveal that some of them are mixtures.

Another fact which stood out conspicuously was that the colon bacillus was very seldom included in the valence of bacteriophages isolated with the intestinal pathogens. Frequently a colon bacteriophage was isolated from the same specimen that contained other phages, but it was usually quite specific for the colon bacillus, and the others did not often attack the colon bacillus. Most observers have remarked upon the regularity with which Shiga bacteriophages attack the colon bacillus, but this has not been true in the present study. The explanation is not yet apparent.

This irregular and wide valence adds uncertainty to the interpretation of isolations from stools until several are found and shown to be the same variety in different individuals in the same epidemic. In order to demonstrate that they are the same, it is necessary to determine their valence against a list of the commoner intestinal pathogens.

It has already been shown that bacteriophages are recoverable with great regularity from patients convalescing from bacillary dysentery and are absent from stools of those not affected. Whether this is true of other intestinal infections awaits demonstration.

Meanwhile outbreaks of gastro-enteritis were occurring and attempts to make use of the method were being tried. Most of the outbreaks were mild to moderately severe diarrheas occurring in short, sharp epidemics, in contrast to the more drawn out course of bacillary dysentery in an institution. Those affected were not prostrated and few or none showed blood or mucus in the stool (see Table II). Stool cultures yielded an occasional organism not easily classified and also an occasional bacteriophage active against some of the pathogens used in the search. The same bacteriophage could not be recovered from a sufficient number of individuals to be significant, nor were those isolated ever active against the organisms found in the outbreaks. Either the intestinal disturbance was due to organisms not included in the list used, or the attacks were so mild that bacteriophages did not appear in the stool. We must not lose sight of the fact that some strains of bacilli are not susceptible to lysis by bacteriophage, though it does not seem plausible that all of the occasional organisms isolated from stools in these outbreaks could have happened to be insusceptible to lysis.

During one season semi-monthly samples were collected from 3 popular beaches near Boston during the spring before the bathing began, and weekly samples during the summer months. The plan was to examine these for bacteriophages to discover the usual ones present with the expectation that a new one might appear if an intestinal outbreak should occur among those frequenting the beaches. One hundred families at each beach were visited regularly and 273 physicians in the communities where the beaches were located agreed to report any intestinal disorders

TABLE II

OUTBREAKS OF INTESTINAL INFECTION

Outbreak	*Type*	*Population Involved*	*Cases*	*Causative Agent*	*Probable Mode of Spread*	*Character of Symptoms*	*Number of Specimens Examined*	*Isolation of Bacteriophage Useful*
Medfield	Institutional	2,100	100	*B. dys.* (Hiss-Y)	Contact and carriers	Violent diarrhea, fever mucus, blood	81	Yes
Williamsburg	Community	1,800	200	Not determined	Water	Purging, no mucus or blood	13	No
Fall River	Family	8	6	Not determined	Food	Furging, no mucus or blood	8	No
Westfield	Institutional	350	36	Not determined	Unknown	Vomiting, purging	45	No
Plymouth	Family	6	4	Not determined	Unknown	Vomiting, purging	6	No
Worcester	Family	7	5	*B. dys.* (Hiss-Y)	Food	Violent diarrhea, mucus and blood	6	Yes
Medfield	Institutional	2,100	500	Not determined	Food	Mild purging	19	No
Northfield	School	2,000	100	Not determined	Water	Mild purging	6	No
S. S. Columbian	Ship	50	40	Not determined	Food	Mild purging	15	No
Northampton	School	1,500	100	Not determined	Food	Mild purging	11	No
Fall River	Community	110,000	500	Not determined	Water	Mild purging	12	No
Danvers	Institutional	3,000	61	*B. dys.* (Hiss-Y)	Contact	Violent diarrhea, mucus and blood	65	Yes
Waverly	Institutional	2,000	156	*B. dys.*	Contact and food	Severe diarrhea, mucus and blood	47	Yes

which occurred. It happened that there was no outbreak among the groups studied during the season. Not even a single case of severe diarrhea was reported. The only information obtained, therefore, was the normal bacteriophage content of the waters of the beaches.

An outbreak in a family in Worcester, however, presented the same situation as in the institutional outbreak mentioned above. Three children were sent to a hospital with a very severe diarrhea. A dysentery bacillus was isolated from the most recent case. Bacteriophages were recovered from the stools of the other 2 children, and at a later date one was found in the stool of the child from whom the organism was isolated. Stools from 2 other children who had had mild attacks were examined and a bacteriophage was found in one. Here again isolation of bacteriophage aided in proving conclusively that all the children were suffering from the same illness.

During this summer outbreaks of bacillary dysentery occurred in 2 other institutions. In an outbreak in Danvers 13.4 per cent of the specimens examined for bacilli yielded a Hiss-Y dysentery bacillus and 55.2 per cent of the specimens examined for bacteriophage were positive. The percentage by weeks is shown in Table III. In an outbreak in Waverly bacilli were found in 10.7 per cent of the samples examined and bacteriophages in 49 per cent. This last outbreak occurred so late that more detailed figures are not yet available. The percentages given include examinations of samples from all cases of diarrhea occurring during the outbreaks, some of which were certainly not due to the dysentery bacillus. In isolating bacteriophages in these 2 outbreaks 2 markedly susceptible strains were used as well as a strain isolated from each institution. Several bacteriophages were obtained which would have been missed if the 2 stock strains had not been used. All of the bacteriophages were shown to be active against the organisms isolated from the institutions. Some of the dysentery bacilli isolated were found to be insusceptible to lysis by the bacteriophages at hand.

TABLE III

DYSENTERY BACILLI AND BACTERIOPHAGES ISOLATED FROM STOOLS
DANVERS OUTBREAK

Week after onset	*Dysentery Bacilli*			*Bacteriophages*		
	Specimens examined	*Number positive*	*Per cent positive*	*Specimens examined*	*Number positive*	*Per cent positive*
1	47	18	38.4	14	8	57.3
2	28	6	21.4	6	4	66.7
3	28	2	6.7	4	2	50.0
4	24	3	12.5	14	8	57.3
5	29	1	3.3	8	4	50.0
over 5	39	0	0	11	5	45.4
	195	30	13.4	58	32	55.2

DISCUSSION

It was a considerable source of disappointment that isolation of bacteriophages failed to be of aid in studying the more elusive epidemics of intestinal infection usually encountered. The fact that the method can be applied to bacillary dysentery, while interesting and of value in certain instances, is not so useful since the usual methods of studying such outbreaks are more satisfactory. However, it is not unlikely that by increasing the list of organisms used in testing, or by some other variation, the method may yet be made to yield information in such intestinal disturbances.

In making isolations from dysentery cases it is recommended that one or two

markedly susceptible strains of bacilli be used until it is ascertained that an organism recovered from a case in the outbreak will pick up bacteriophages from all stools in which they are present.

METHODS USED

Except for the time consuming operation of filtering through a Berkefeld filter, isolation of bacteriophages is no more complicated than isolating bacteria. Some of the ways of simplifying filtration were reported in a recent paper.[2]

COLLECTION OF SPECIMENS

The specimens should be collected without any differential or inhibiting fluid such as used in typhoid and other culture outfits. A satisfactory method is to saturate thoroughly and cover the cotton swabs in a diphtheria culture outfit. Drying does not appear to inactivate the bacteriophage at this stage.

ISOLATION INVOLVING FILTRATION

The simplest method of isolation is to place 5 to 10 c.c. of plain broth in contact with not more than 1 gm. of feces and after 15 to 30 minutes decant into a Berkefeld filter and pass through an "N" candle. To a tube of broth, seeded lightly with the organism causing the outbreak or with a stock strain, add 0.5 c.c. of the filtrate from the stool and incubate 18 to 24 hours. A control tube containing only the organism should be set up. If a strong bacteriophage is present, the tube containing the filtrate may be clear while the control will be turbid. If the bacteriophage is weak, no clearing may appear, in which case it is necessary to make sure no bacteriophage is present. There are 3 methods by which this may be done.

1. The most accurate method of checking up on doubtful tubes is to transfer 0.05 c.c. to an 18 hour broth culture of the organism, thoroughly mix, and then smear 0.1 c.c. evenly over the surface of an agar plate. This is best done with a bent glass rod sterilized by dipping in 95 per cent alcohol 2 or 3 times—each time allowing the alcohol to burn. The inoculating culture should be heavy enough to produce a complete film of growth, with no separate colonies visible. If bacteriophage is present, plaques will show in the bacterial film on the surface of the plate. Sometimes, however, a very active bacteriophage may completely inhibit growth, and there will be practically no colonies on the plate.

2. Another method is to smear a loopful of broth from the doubtful tube and another loopful from the control, each on separate spots about 1 cm. in diameter or larger on an agar plate. Lysis will be indicated by (1) no growth; (2) a scanty growth; or (3) plaques in the bacterial film. The amount of reduction in growth can be determined by comparing with the control.

3. The third way to check up on tubes showing no clearing is to seed thoroughly the surface of an agar plate with the organism. Then with a loopful of material from the tube make a circle on the surface of the agar. Make one also with the control for comparison. If bacteriophage is present, it will be indicated on the ring by more or less inhibition of growth of the organism or by a few well defined plaques. Usually the bacteriophage particles are much more numerous at 18 to 24 hours than the resistant organisms which have begun to grow out, and the latter do not interfere materially in interpreting the results on the plates.

ISOLATION WITHOUT FILTRATION

It is possible to isolate bacteriophages without filtering the material from the stool through a Berkefeld filter. The percentage of isolation will not be high, however, since only the most active ones

will be recovered in the presence of the rapid growing and spreading bacteria or of the spore forming organisms which will be encountered in stools. The stool specimen should be placed in contact with broth as outlined above, and 0.5 c.c. of the broth placed in an 18 hour broth culture of the organism causing the outbreak. After 12 to 24 hours incubation, the tube is placed in a water bath and the temperature held at 60° C. for ½ hour. This will usually kill the vegetative bacteria and not harm the bacteriophage. A very small loopful of the material is then placed in an 18 hour broth culture of the organism and immediately plated out as described above. The presence of bacteriophage will be shown by plaques or by complete inhibition of growth.

SPECEFICITY OF BACTERIOPHAGES

The bacteriophages isolated in this study were brought to full activity by serial transplanting in broth cultures of the susceptible organism and then filtering. The filtrates were placed in contact with the organisms named in Table I plus the 5 English strains of Flexner dysentery bacillus (V, W, X, Y, and Z). One drop of filtrate and 1 drop of broth culture of the organism is placed in a tube of broth. Controls receive only the organism.

A great deal of labor was saved by using special metal battery boxes, each holding two rows of 10 tubes each. These were modified from similar ones described by Wells,[3] the principal change being to leave the lower 2 inches of the tubes exposed instead of the middle, and to increase the number of tubes from 10 to 20 per box. These boxes eliminated handling cotton plugs when filling the tubes as well as when inoculating them. One row of tubes can be lifted up with a special lifter while observing the other. In using the boxes a separate row was used for each organism, 9 tubes receiving bacteriophages and the 10th being left as a control.

Another time-saving apparatus was devised to fill the tubes of broth more rapidly. It consists of a glass syringe and a special valve connected with a reservoir which automatically measures out the proper amount of broth when a tube is pushed against the bottom of the valve.

The tubes were left at room temperature for 18 to 24 hours. Incubation at 37° C. causes the resistant organisms to grow out more rapidly, and frequently tubes which have cleared within 6 to 12 hours will again become turbid by the end of 24 hours. At the end of 24 hours all tubes and controls were plated out on agar in numbered squares corresponding to the numbers of the tubes in the protocol. Sixteen to 20 squares can be marked off on a plate. An area about 1 cm. in diameter is evenly covered with a small loopful from each tube. Frequently bacteriophages are found on the plates which would have been missed because of failure of the broth tubes to become clear.

SUMMARY

In outbreaks of bacillary dysentery bacteriophages active against the organism causing the outbreak were isolated from the stools of 60 to 80 per cent of those showing clinical symptoms, when stools were obtained during the second week after onset.

In outbreaks due to other causes bacteriophage isolation did not yield any useful information.

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NOTE: Laboratory facilities and technical assistance for carrying on this study were made available through the courtesy of Dr. W. G. Smillie, Harvard School of Public Health.

Outbreak of Milk Poisoning Due to a Toxin-Producing Staphylococcus Found in the Udders of Two Cows*

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SO far as the authors are aware, Barber (1914) first suggested that a toxin-producing staphylococcus was responsible for cases of food poisoning, when he described cases of gastro-enteritis which had occurred from time to time (1909–1913) on a certain farm in Nueva Ecija Province, Luzon, P. I., and attributable to the ingestion of improperly refrigerated milk which contained staphylococci in abundant quantities.

During the past three or four years outbreaks of food poisoning due to staphylococcus "enterotoxin" have been reported by a number of investigators, notably Jordon, and indeed the splendid work of Jordon and his associates has stimulated a widespread interest in the problem.

This report refers to a series of outbreaks of acute food poisoning occurring at Pleasant Hill Academy, Pleasant Hill, Tenn., from time to time during the period July 27–October 20, 1933.

Pleasant Hill Academy is a preparatory school operated under the auspices of the American Missionary Association, and situated on the Cumberland Plateau in Cumberland County, Tenn., 90 miles west of Knoxville and 120 miles east of Nashville.

The school owns a farm of several hundred acres. A herd of 13 cows supplies all of the milk. Practically all of the labor at the school is done by the students. They work on the farm, cook, wait on table, fire furnaces, do janitor work, and operate the laundry.

The principal and his family reside in a separate house on the school campus, and the farm-manager occupies an apartment in one of the dormitories, and for these two families meals are prepared and served within their respective homes. The remainder of the faculty members and all of the resident students live in the dormitories and eat in one dining room, the arrangements being such that one faculty member is placed with each table of students. Thus, with the exception of the principal and farm-manager, the faculty and student body have the same food supply.

During the period June–August, 1933 (school vacation), the only persons who lived on the school premises were the

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families of the principal and the farm-manager and 2 students who helped with the operation of the farm and dairy, these students staying in the dormitory and boarding with the farm-manager.

On July 27, 1933, cases of acute poisoning occurred in all of the 6 members of the household of the farm manager, including the 2 students. Clinically, the cases were characterized by acute and sudden onset of nausea and vomiting, and in some instances prostration. Purging and diarrhea did not occur in these cases, but were prominent symptoms in later outbreaks. All cases were reported to be afebrile, and recovery rapidly followed emptying of the stomach. All of the cases had onset within 15 minutes of each other, the time being about 10 a.m., or approximately 3 hours after breakfast.

School opened during the last week of August, 1933, when 88 resident students enrolled, and these, with 9 faculty members, made a total resident population of 97, ranging in age from 14 to 54 years, and including 51 females and 46 males.

On September 4, 1933, the second outbreak occurred involving 45 cases, all having onset at about 9 p.m., or approximately 3 hours after the evening meal. In this and in all subsequent outbreaks no cases occurred in the family of either the principal or the farm-manager. Subsequent outbreaks occurred on September 13, 20, 27, October 2, 10, and 20.

It is interesting that the 7 outbreaks which occurred following the opening of school were rather evenly distributed with respect to time, the intervals between successive outbreaks ranging from 7 to 10 days.

A total of 242 cases occurred, 233 in students and 9 in faculty members. Students suffered an attack rate 2.9 times that of faculty members, the rate for the former being 2.9 cases per person and for the latter 1 case per person. In 2 of the outbreaks the approximate hour of onset of cases was 9 p.m. and for the remaining 5 was 10 a.m.

Table I shows for each of the 7 outbreaks the date, the approximate hour of onset of the cases, and the number of

TABLE I

DATES OF OUTBREAKS OF FOOD POISONING, APPROXIMATE HOURS OF ONSET OF CASES, AND NUMBER OF CASES WITH CASE RATES IN STUDENTS AND FACULTY MEMBERS AT PLEASANT HILL ACADEMY, TENN.—SEPTEMBER 4–OCTOBER 20, 1933

Date of Outbreak	Approximate Hour of Onset	Number of Cases			Case Rate (=100)		
		Students	Faculty	Total	Students	Faculty	Total
Sept. 4	9 P.M.	44	1	45	50.0	11.1	46.4
" 13	10 A.M.	30	2	32	34.0	22.2	33.0
" 20	10 A.M.	15	0	15	17.0	—	15.5
" 27	10 A.M.	25	1	26	28.4	11.1	26.8
Oct. 2	9 P.M.	34	2	36	38.6	22.2	37.0
" 10	10 A.M.	16	0	16	18.2	—	16.5
" 20	10 A.M.	69	3	72	78.5	33.3	74.5
Total		233	9	242	290.0	100.0	250.0

cases with case rates in students and in faculty members.

The explosiveness of the outbreaks, with all cases having onset within 15 to 30 minutes of each other, indicated that the etiologic agent was transmitted from a common source; and the consistency with which onset of cases occurred 3 hours following a meal further indicated that food was the most probable vehicle.

The absence of temperature, the abrupt and violent onset, the short duration, and rapid recovery without material after-effects all tended to indicate that the illness was due to a toxemia or poisoning rather than an infection.

The cases were not reported to the State Health Department until October 3, on the morning following the 5th outbreak. Investigation was made by one of us (J. A. C.) at that time, when epidemiological case records were obtained for all of the cases which had occurred previously. Subsequent cases were investigated within less than 24 hours following onset.

In the students the distribution of cases with respect to sex and age was in no way unusual. In the faculty members, the numbers were too small to justify comparisons.

Since a total of 242 cases occurred in 97 persons, it would follow that a number of persons suffered repeated attacks. The distribution of persons according to the number of attacks is shown in Table II.

TABLE II

DISTRIBUTION OF ATTACKS

Number of Attacks	*Number of Persons*	*Per cent of Total*
5	12	12.4
4	16	16.5
3	19	19.6
2	26	26.8
1	9	9.3
0	15	15.4
	97	100.0

Because of the practice of the school of assigning one faculty member for each group of students at a table, both students and faculty members ate the same food, which was served and prepared by the same people.

Information was obtained as to the various articles of food consumed by each of the 97 persons at the meals immediately preceding onset of the cases.

With the exception of milk, no article of food eaten during these meals appeared more frequently in the diet of those ill than of those not ill.

Table III shows for each of the outbreaks the number of cases, and case rate in persons who drank milk during the meal immediately preceding onset of cases, and for comparison the attack rate in those who did not drink milk.

Out of the 242 cases, all but 1 occurred in persons who had drunk milk during the meal immediately preceding onset. The attack rates in milk consumers varied from 17.6 per cent on September 20, to 81 per cent on October 20. In view of subsequent data which clearly established the fact that milk was the vehicle of the causative agent, it is quite likely that for the case occurring in the person who denied drinking milk, either the history was unreliable, or perhaps the illness may have been of another nature.

Following the outbreak of October 2, fecal specimens from all of the 37 persons who were in any way connected with the handling of food were examined for the typhoid, dysentery, and salmonella group of organisms with entirely negative results.

Following the outbreak of October 20 all articles of food served at the meal immediately preceding onset, and also pooled specimens of first vomitus of the patients were examined both bacteriologically and chemically. In addition, specimens of throat secretions from all of the food handlers were immediately streaked on rabbit blood-agar plates and

TABLE III

CASES OF FOOD POISONING AND ATTACK RATES IN PERSONS WHO:
(A) DRANK MILK AT THE MEAL PRECEDING ONSET
(B) DID NOT DRINK MILK AT THE MEAL PRECEDING ONSET

Date of Outbreak	Drank Milk at Meal Preceding Onset			Did Not Drink Milk at Meal Preceding Onset		
	No. Persons	Cases		No. Persons	Cases	
		Number	Attack Rate (=100)		Number	Attack Rate (=100)
Sept. 4	85	45	53.0	12	0	0.0
" 13	89	32	36.0	8	0	0.0
" 20	85	15	17.6	12	0	0.0
" 27	88	25	28.4	9	1	11.1
Oct. 2	83	36	43.4	14	0	0.0
" 10	88	16	18.2	9	0	0.0
" 20	89	72	81.0	8	0	0.0

brought into the laboratory for bacteriological examination. The articles of food included cereal, sugar, toast, coffee, milk, bacon, scrambled eggs, apple sauce, and butter. The chemical examination * included a search for arsenic, lead, strychnine, mercuric chloride, barium and antimony salts, phosphorus, and various alkaloids. Results of chemical analyses were entirely negative.

In the bacteriological examination, each article of food and the vomitus were examined directly by stained smear (Gram) and a loopful was planted for culture on plates of plain agar, Endo's, eosin-methylene blue agar, and 3 per cent rabbit blood-agar.

All of the articles of food except milk contained only very few bacteria, and these were of various types.

From the milk and the vomitus, hemolytic staphylococci were obtained in enormous numbers and practically in pure culture. The staphylococci were decidedly hemolytic and were of both the albus and aureus types, the ratio of aureus to albus being about 40 to 1.

Of the 37 food handlers whose throat secretions were planted on rabbit blood-agar plates, 12 showed large numbers of hemolytic staphylococci, both aureus and albus, the aureus predominating in a ratio of 50 to 1. Incidentally, all of these 12 persons had suffered attacks of poisoning less than 24 hours before the specimens were obtained. These 12 persons were reëxamined at 3 day intervals during the following 3 weeks, and in all of them the organisms had disappeared apparently by the end of this time. Each succeeding examination showed a diminished number of organisms, and in all but 3 persons, results of examinations were negative at the end of 12 days.

The staphylococci recovered from the milk, the vomitus, and the throat secretions of the food handlers were tested for production of toxic products, the

* Chemical examinations were made by Dr. J. W. Sample, Chief Chemist, Tennessee State Department of Agriculture, Nashville.

technic employed being that described by Woolpert and Dack (1933).

In testing for the presence of enterotoxic substance in the filtrates from these organisms only human volunteers were employed. Three c.c. of filtrate in approximately 3 ounces of pasteurized milk were given to persons who had not eaten any food for more than 5 hours. Where illness followed the ingestion of these filtrates, the incubation period was shorter (though somewhat variable for different filtrates), and symptoms were less severe, but otherwise clinically identical with those occurring in the outbreaks.

Although a sufficient number of human volunteers could not be obtained to test all of the filtrates that were prepared, some of the organisms recovered from the milk, the vomitus, and the throat secretions of the food handlers were tested.

The yellow staphylococci recovered from the milk, the vomitus, and from 5 of the 12 food handlers proved to be toxin-producers, the filtrates producing illness in all of the human volunteers. Filtrates from the organisms isolated from the milk and the vomitus produced symptoms within 30 minutes, but those from the 5 food handlers produced illness with incubation periods ranging from 1½ to 3 hours.

In these tests, 8 persons were used as controls, these being fed milk and sterile media, and none of them became ill.

All epidemiological evidence, supported by bacteriological findings, indicated that milk was the most probable vehicle of the "enterotoxin." However, it was necessary to determine the source of the organisms which apparently produced the "enterotoxin"; *i.e.*, whether the secreted milk itself contained the organisms, or contamination occurred through handling of the milk by one or more infected food handlers. The latter possibility was suggested by the fact that 12 of the food handlers were found to harbor the organisms in their throats.

Beginning October 23, specimens of milk were obtained under as nearly aseptic conditions as possible from each of the 13 cows, at a rate of 3 specimens per week (every other day) for a period of 5 weeks. During this period, specimens from 2 cows (Nos. 2 and 7) showed almost consistently a large number of hemolytic staphylococci. Specimens from 4 other cows occasionally showed the organisms, but filtrates from these when fed to human volunteers failed to demonstrate enterotoxic substances in 50 c.c. amounts.

Of the 12 specmens from cow No. 2, 9 contained hemolytic staphylococci, and from Cow No. 7, 12 of the 15 specimens were positive. Both the aureus and albus types were found in the milk from each cow, the aureus predominating in proportions, ranging from 25 to 1, to 60 to 1. Filtrates from the albus produced no symptoms when fed in 50 c.c. amounts to human volunteers. Filtrates from 7 different aureus cultures produced illness in 12 of 15 human volunteers when fed in 3 c.c. amounts.

The number of organisms to the c.c. of milk from cow No. 2 averaged about 2,900, and from cow No. 7, about 4,500. One specimen showed a count as high as 17,500, while others contained only a few. A negative specimen would usually be followed by a tremendous increase to the maximum bacteria count. Table IV shows the results of examinations of the various specimens of milk taken from cows Nos. 2 and 7 over the 5 week period.

Evidently somewhere in the udders of these 2 cows there were pus pockets which would occasionally break loose, producing a "showering" of staphylococci, followed by a gradual diminution in number of organisms for a time, after which another "showering" would take place. This recurrent "showering" of organisms is of particular in-

TABLE IV

RESULTS OF EXAMINATIONS OF SPECIMENS OF MILK TAKEN FROM 2 COWS AT PLEASANT HILL ACADEMY, TENN., OVER THE PERIOD OCTOBER 23 TO NOVEMBER 27, 1933

Date	Number of Hemolytic Staphylococci per Cubic Centimeter of Milk	
	Cow Number 2	Cow Number 7
Oct. 23	2,500	1,500
" 25	1,500	200
" 27	100	0
" 31	50	0
Nov. 3	5	17,500
" 5	0	14,200
" 8	0	5,000
" 10	14,000	1,000
" 13	8,000	75
" 15	5,000	0
" 18	300	15,700
" 20	0	9,600
" 23	No specimen	1,800
" 25	No specimen	150
" 27	No specimen	25

terest in view of the recurrent and more or less evenly spaced outbreaks of poisoning.

These 2 cows were examined by a veterinarian who stated that they had "Garget" or mastitis which is a chronic infectious disease characterized by recurrent acute attacks when the cow is drying off, when she freshens, when she is fed heavily on a high protein diet, or when she is otherwise exposed to unusual strain. If the disease is acutely active, the milk may be changed in appearance. The milk from both of these cows was at times ropy and stringy, containing red blood cells and numerous pus cells. From cow No. 7, the milk on two occasions showed the presence of macroscopic blood.

The school dairy consisted of 13 cows, tuberculin tested annually and apparently in good physical condition. The dairy barn is of reasonably modern construction, with individual stalls for the cows, cement floor, and ample water supply.

The milking is done by hand, by 5 boys who are students at the school. Generally speaking, sanitary precautions concerning the milkers, the cows, and the milk utensils could be regarded as satisfactory.

Each milker used an ordinary 1 gallon milk pail from which the milk was transferred, at the dairy barn, directly into 5 or 10 gallon cream cans. In this transfer the milk was strained through clean cheesecloth.

With the exception of that which went to the residences of the school principal and farm-manager, all the milk was carried from the barn to the kitchen (in the girl's dormitory) in these large cream cans, and stored in these containers until it was served. The kitchen contained two refrigerators, one an ordinary commercial Frigidaire and the other a built-in cold storage room, both being refrigerated by means of one electrical motor located in the basement of the kitchen. The cold-storage room was used largely for the storage of meat and these large containers of milk. The temperature in this room was considerably higher than that in the commercial Frigidaire.

The milk which was brought in at night was stored over night and served the following morning. The morning's milk was usually served at the evening meal.

The milk which went to the residences of the school principal and farm-manager was carried directly from the dairy barn to the residences in the small milk pails, transferred to milk con-

tainers and immediately placed in the refrigerators in the respective residences. Because of the much smaller milk containers and the lower temperatures in the refrigerators, the milk for the families of the school principal and farm manager became chilled very much more quickly and was brought to a lower temperature than that stored in the large cream cans and served to the rest of the resident population. This rapid chilling presumably inhibited the growth and toxin-production of the staphylococci present in the secreted milk, and therefore offers the most plausible explanation of the fact that no case of poisoning occurred in any member of these two households, notwithstanding the use of milk from the same cows that supplied the rest of the faculty and student body.

Recommendations to the school authorities embodied removal of 2 of the cows from the herd, and measures directed toward improvement of refrigeration facilities. These recommendations were put into effect immediately, and no additional cases of poisoning have been reported to date.

DISCUSSION

We believe that this is the first recorded outbreak of poisoning due to enterotoxic products of the staphylococcus where it was possible both to identify the enterotoxic substance, and to determine the source of the staphylococcus.

The circumstances under which the outbreak occurred merely add to already overwhelming evidence supporting the need for rigid sanitary control of milk supplies.

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Maternity Benefits in Cuba

A DECREE signed by the President of Cuba on April 18, 1934, prohibits the employment of women for 6 weeks following confinement. The prohibition applies to all establishments, whether industrial or commercial, public or private.

According to this decree a pregnant women is permitted to leave her employment 6 weeks before the probable date of childbirth, upon presentation of a physician's certificate. For the duration of her absence from work the woman is to receive a cash benefit equal to her wages, paid from an insurance fund to which the State, the employers, and the women workers will be required to contribute. Attendance by a physician or midwife will also be provided.

An employer must permit every nursing mother to have two daily periods of half an hour each in which to nurse her child, exclusive of the rest periods provided by law.

Pregnancy or illness connected with it must not constitute a cause of discharge, unless the woman's absence exceeds the time allowed for that purpose.

No pregnant woman may be employed on strenuous work or on work that may interfere with the normal development of the child.

Every industrial or commercial establishment employing 50 or more women must provide a day nursery for employees' children under the age of 2.

Fines are provided for violations.—*Gaceta Oficial de la Republica de Cuba*, April 20, 1934.

Health Hazards in the Oil Industry*

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OIL is the miracle worker of our modern world, satisfying man's needs, not only in meeting demands of commerce and recreation, but furnishing heat, light, power, transportation, lubrication, cleaning, insect extermination, and medicines—a field, our chemists tell us, the surface of which has been only scratched. What a challenge to them!

The industrial hygienist receives the same challenge, for the possibilities of health hazards are many in the oil industry with its numerous and diversified processes. The literature on this subject reveals a wonderful lack of actual hazards; but the potential possibilities remain, nevertheless, when an analysis of the individual and varied operations is made.

Four major divisions of the oil industry combine to bring the oil and its various products to the public.

1. *Production* with its geological, drilling and pumping operations
2. *Transportation* with its pipe lines, pump stations, ships with their terminal facilities, automobiles with their garages and shops, and railroad tank cars
3. *Refining* with its stills, natural gasoline, grease, and other plants, tank farms, test and research laboratories
4. *Marketing* with its storage tanks, warehouses, and service stations

There are the usual service divisions necessary for the conduct of business on a big scale. However, the employees in these divisions are office or shop workers primarily, and are not subjected to the health hazards characteristic of the major divisions, which are our chief concern.

There is one hazard common to all the major divisions, namely, gas vapors and fumes which are given off by the oil and its products. The effect of these is not so much incipient and cumulative, as it is sudden, due to the nature of the poisons in the gases and vapors.

First, we have the higher hydrocarbons—methane, ethane, propane, the butanes and, to a lesser extent, the lower hydrocarbons. The higher group, under certain conditions, are harmful to health. Some act as asphyxiants, others as irritants, and even in small quantities are poisonous. Those of the lower group may be similar in their action, but do not directly affect the body tissues or the delicate structure of the lungs; and produce no evidence of anything suggesting chronic poisoning, even when inhaled in considerable quantities day after day. Possibly the reason for this is that these lower gases are chemically inert and lacking in tendency to promote organic decay.

These hydrocarbons are found more in natural gas and refinery gas than in crude petroleum. Their composition is related to the temperature, consequently appreciable quantities cannot be present until the temperature is near the boiling point. An atmosphere containing more than 0.2 per cent of hydro-

* Read before the Industrial Hygiene Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 4, 1934.

carbon gas or vapor may be considered as dangerous.

We may have hydrogen sulphide in petroleum or its products, and here is a real health hazard, for its poisonous effects are well known, even when the air contains only 0.0005 per cent. Fortunately, this gas is encountered in but few of the oil districts. The proportion is ordinarily under 1 per cent, but as high as 15 per cent has been found. The light oils in Mexico have the highest percentage. Those in Ohio and the mid-continent fields have considerably less, while scarcely any is found in the oils in California.

Carbon dioxide, of course, is here, there, and anywhere, because it is the chief product of complete combustion. It is found, primarily, at all wells in flue gas, and in wash gas from furnaces and engines. This gas is not considered as containing poison which is deleterious to health; but it will surely put one out if he gets enough of it, and not infrequently, the recipients remain sick for days.

Unlike carbon dioxide, carbon monoxide is one of the most insidious of the poisonous gases encountered in the oil industry. It is produced in the burning of carbon containing materials such as natural gas, coal, coke, wood, or gasoline, whenever the supply of air is not sufficient for complete combustion. Due to the outdoor nature of the oil industry and proper disposal of the waste from the furnaces and engines, concentrations of this gas are not likely to occur. Automobiles on the move and garages present the most serious hazards, but so much has been written about carbon monoxide in relation to the automobile, it is not necessary to review the subject here. I refer you to the *Travelers Standard* (Vol. XXII, Mar. 3, 1934).

Sulphur dioxide is a product of combustion when sulphur or any fuel containing sulphur or sulphides is burned, and is the chief irritant present in flue gases when natural gas or any gas containing hydrogen sulphide is used as a fuel. It is also formed when coal is burned, and when lubricating oils are treated with sulphuric acid. It is used as a treating agent for the purification of gasoline, naphtha, kerosene, and lubricating oils, so is primarily used in refineries. It is handled in cylinders, as it is poisonous if over 0.004 per cent, but it is so irritating to the eyes and lungs in small concentrations that a person coming in contact with some of the escaped gas will get out of it before he experiences any poisonous effects.

From a detailed review of the chemistry of these gases, which is not permissible in so short a paper, it must be concluded that the hazard is primarily that of irritation and asphyxiation even with the more poisonous ones. Whether there is any detrimental cumulative effect on normal or pathological body tissues, or an aggravation of an existing condition from the inhalation of these gases in small quantities over a period of time, is a question to which there is no satisfactory answer. The literature is almost nil—expressions vague—which indicate that little research has been done.

As the compensation laws in the various states are changed to make industry responsible for industrial injuries, including the aggravation of existing physical conditions, as they are in California, the answer will be forthcoming. In this connection, let me cite a case under my personal observation of an employee who had worked 8 years as a mechanic. His duties required him to repair pumps in the pipe line stations. In working on the opened pumps he would be more or less exposed to the oil with its fumes and vapors. He developed a chronic nephritis, and after he died, his family brought claim under

the Workmen's Compensation Act for the total amount of the death disability, which under the California Law is payable if death results from the aggravation of an existing condition. Also, under the law, an employee only has to state he is injured, and the company pays unless it can prove he is not. I had a pump opened in order to reproduce the conditions under which he worked; had the gases and vapors analyzed; the amounts of the various gases in the air measured as to volume at various levels from the floor to the ceiling; made diagrams of the station showing method of ventilation, and air space; secured copies of our instructions to employees as to what to do when working in gases and vapors; had fellow workers in his crew ready to testify that claimant knew the instructions and observed them. I then sought the opinions of medical specialists, some of them with much experience in the oil industry, as to whether or not these conditions as stated could produce or aggravate a nephritis or any other kind of an "itis" in the human body. The consensus of opinion was that the gases and vapors were only irritating and anesthetic in action, and would not aggravate existing physical conditions.

At the trial, the claimant's attorney introduced evidence to show that the company had exposed his client to petroleum fumes and vapors, and then introduced exhibit "A"—a pamphlet issued by the U. S. Public Health Service, which dealt with the subject of Poisonous Effects of Benzol in Petroleum on the Human Body. He stated that the Service was the highest authority and most expert on such subjects, and rested his case. It was a simple matter to put our chemist on the stand, who testified there was no benzol in the petroleum or its gases passing through our pipe lines, although it was found in some oils outside of California. No evidence of poisoning by other elements was introduced, so nothing was proved or disproved.

In considering the petroleum vapors and gases as a health hazard, let us not overlook the menace due to their explosive characteristics.

Another hazard common to all the major divisions is the production of skin rashes, blebs or pustules from direct contact with the oil or its products. This affects employees in varying degrees—some not at all, while others cannot be allowed to work in contact with the oil, and especially the distillates.

Let us now consider separately the hazards incident to each major division:

PRODUCTION

If you stand on the floor of an oil rig while drilling is in operation, you are impressed with the possibilities of the accident hazards. But what about the health? Well, the men seem healthy for they are out in the open, but they are out through wind or rain, heat or cold, day or night, and, theoretically, such exposure is certainly not conducive to good health.

We know noise is detrimental to the sense of hearing, is fatiguing, is depressing to the nervous system. At times, gas escapes from a well for hours, and the men have to work in this roaring sound even though they can keep clear of the gas fumes, and this may have a decided and often a prolonged effect on hearing, in some cases.

The repeated removal of foreign bodies from eyes is detrimental to sight, but frequent washing of the drill pipe and greasing of the cables has minimized this hazard.

The pumpers, or those employees who service the wells after they are on production, are, I believe, quite free from health hazards except those due to natural elements. Regulation of health habits cannot be maintained due to the shift work. This is also true of most of the workers in the major divisions.

TRANSPORTATION

In this department, the main hazard is exposure to the fumes and vapors. Storage tanks, reservoirs, railroad tank cars, holds of oil tankers, pipe lines and their pumps have to be cleaned. Opening them up to fresh air, washing them down, steaming them out—experience has taught us—is not enough. This is usually done by opening a small manhole in the top, over which the gauger stands and may inhale fumes. The full tank is not the dangerous one—but beware of the partly filled tank. There is room for the accumulation of plenty of gas. Leaking valves or cracks in the casings are sources of exposure usually unknown and unseen. An additional hazard in this department is dust from filings and scaling resulting from cleaning the pipes and tanks.

REFINING

Add to the gases and vapors already described, ammonia and chlorine. Then we have a list of the gases and vapors with which refinery workers may come in contact. What has been said about the danger of them can also be said about ammonia and chlorine—namely—they are primarily accident hazards, and not health hazards as we know them, but ammonia will produce a chronic catarrh if inhaled with air in a proportion over 0.15 per cent. Keep these gases and vapors in their containers by preventing leaks, and by proper vents in the pipes, stills, tanks, and ovens; and by the wearing of properly selected gas masks when the employees do encounter them, and you will have safe and healthy refinery workers.

However, there are other materials used which may prove to be a health hazard. I refer to sand, lead, paraffin, tar, acids, and alkalies. Sand is used in cleaning, as sand blasting; although I believe this method is being increasingly discontinued. The effect produced by inhaling sand particles is known as silicosis, which is a subject in itself. The method of its use and control is well described in a pamphlet, *Safeguarding Sand Blasting Operations*, issued by the Standard Oil Company of New Jersey under date of February 9, 1934.

Recently, lead which is well known as a health hazard has been introduced into the industry in the form of tetraethyl lead. It proved to be a real hazard, and in the beginning caused several deaths in the manufacture and blending process. This cannot be charged to the oil industry, however, as the manufacturing is done by a special corporation. The finished product is received at the refineries in tanks, and under supervision of the Ethyl Gasoline Corporation is mixed into the gasoline by specially selected workers. The process is so automatic that the amount of vapor to which an employee is exposed is negligible. However, every precaution is taken by the employee as instructed by the Ethyl Corporation.

Crude oil and all the distillates may be contacted by the refinery worker. These products affect the skin to a greater or less degree. Usually a simple irritation is first produced, or there may be furuncles, papillomata, plaques, and even skin cancers are reported. The lower distallates, paraffin and tar, are the greatest offenders in producing real skin lesions; while the higher ones give rise to skin dryness, cracking, and simple dermatitis.

We cannot leave the refinery without mentioning that acids and alkalies are used in the preparation of petroleum products, but these are not volatile, and so no real health hazard; but do cause many burns, so again we have the accident hazard.

MARKETING

Lead chloride, bromide, and sulphate result in the form of dust from com-

bustion of ethyl gasoline. Does this produce a health hazard to the drivers of cars, to garage men, and mechanics working in cars using ethyl gas, and to the public? Extensive researches have been carried out by the Kettering Laboratory of Applied Physiology, and the results of their experiments are described in their pamphlet, *An Appraisal of the Lead Hazards Associated with the Distribution and Use of Gasoline Containing Tetraethyl Lead*. These results lead one to the conclusion that this hazard is negligible to garage attendants and mechanics; so practically nil to service station attendants and the public.

The only other hazard I have observed in the marketing division is irritation of the eyes of service station attendants which is caused by acids used in cleaning the springs of cars, and the use of trisodium phosphate for cleaning about the stations, especially the lubricating racks.

Health problems which are common to all employees in the oil industry, as well as to employees of other industries, deserve special consideration, although time will not permit of a full discussion. However, I want to mention 3—the common cold, vision, and syphilis.

A few years ago I offered our employees free inoculation with the Mixed Respiratory Vaccine. About 1,000 of the 6,000 employees have taken it, all of whom stated they were subject to colds. Of that number, 75 per cent report that they have had no colds since; 12 per cent that their colds have been fewer and less severe; and 13 per cent report no benefit. In reviewing my physical examinations of the no-benefit group, I discovered that nearly all of them were suffering from some form of chronic infection, such as sinusitis, rhinitis, pharyngitis or bronchitis. The conclusion, therefore, as to the real value of the vaccine is obvious.

For years I have been impressed by the great amount of relief obtained from physical symptoms by proper treatment of the eyes. Early in my medical program I had an eye survey of the employees made by a doctor specializing in sight conservation and industrial illumination. He reported:

	Per cent
Normal vision	70
Subnormal vision	30
Pathological eyes	7
Recommended for vocational placement	2
Wearing glasses	22
Wearing glasses properly fitted	42
Wearing glasses improperly fitted	58

Again the conclusion as to the real value is obvious.

Three years ago I included a Wassermann test as part of the physical examination, and 3.4 per cent of the employees gave a positive reaction. Of the number positive, 32 per cent admitted knowledge of infection, and 68 per cent denied any knowledge of infection. From my talks with the ones denying any knowledge of infection, I believe they were, with possibly 2 exceptions, sincere in their belief. From what we are told this is indeed a low per cent of positives, but it does mean that 2 per cent of the oil workers have syphilis who do not know it.

To tell a wage earner in these times of small wage income that he needs treatments for syphilis is creating a mental hazard unless treatments are offered at not more than the cost of medicine and materials used. Furthermore, the majority of cases are past 40 years of age, married, and have families. Thus, social as well as mental and financial problems are created. Only 4 per cent of my cases refused to take treatment, and among those treated, the reduction of the positive Wassermann findings has been indeed discouraging; so I present you the problem. What are we going to do about finding and treating the employee infected with syphilis?

Conclusions to be drawn from this paper certainly are that health hazards in the petroleum industry are few and are easy to control. The more important hazards are due to the natural elements, and the method of working the employees. Chemical poisons are present in the form of gases and vapors, but they are more of an accident hazard than a health hazard.

Health problems outside of health hazards give the physician working in the oil industry a larger field of activity.

Simon Baruch Laboratory at Saratoga Springs

A NOTABLE company of physicians and men and women in public life gathered at Saratoga Springs, N. Y., on September 14 to witness the laying of the corner stone of the new Research Laboratory of the Saratoga Spa. Governor Herbert H. Lehman, who presided at the ceremonies, gave the laboratory the name of Dr. Simon Baruch, a pioneer in hydrotherapy in this country and professor of hydrotherapy at the College of Physicians and Surgeons for many years. The Saratoga cardiac therapy was based upon studies of European spas and long clinical experiment by Dr. Baruch. Dr. Herman B. Baruch, his son, laid the stone.

Dr. John Wyckoff, Dean of New York University-Bellevue Medical College, was the orator of the day. He stressed "the purpose and the value of an establishment such as is being developed here in Saratoga, in its relation to chronic illness."

Completed and equipped, the Simon Baruch Research Laboratory will represent an investment of $750,000.

The Baruch Laboratory will be ready for use in 1935. It is one of the monumental group of buildings, all in process of construction, now going up at the Spa and which will, together, cost in excess of $5,000,000. These buildings include the Hall of Springs, whose corner stone was laid in July, 1933; a new bath house of distinctive design and purpose, a hotel with sanitarium facilities, a new plant for the bottling of Geyser, Hathorn, and Coesa waters, and a recreation center, at which the remedial uses of sports will be stressed.

Pierrepont B. Noyes, of Oneida, N. Y., is chairman of the Saratoga Springs Commission. Its medical members are Dr. Carl R. Comstock, of Saratoga Springs, and Dr. L. Whittington Gorham, of Albany.

Public Health Aspects of Dried Foods*

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WHETHER drying or cold storage is the older method of food preservation used by man is a matter of speculation. Certainly both methods must have been practised in prehistoric times, and antedate any of the other methods now employed. The methods are also similar in fact that in modern times their use has been extended to new products through the use of new principles and new equipment. From the point of view of continuity of employment and essential stability of method, drying must be regarded as an eminently useful art in the advancement of human society.

Broadly speaking, we may consider drying as applicable to all classes of foods, including grains and spices. Usually we do not include the grains which ordinarily dry spontaneously without requiring special control of the process, nor do we include spices which, though often preserved by drying, have little direct nutritive value and may often be used to assist in the preservation of other foods. Between these extremes of usefulness all the other essential foods may be and are extensively preserved by controlled processes of drying. The list includes fish, meat, milk, eggs, fruits, and vegetables.

In view of its wide application, the public health significance of drying is naturally of interest. While dried foods appear not to have been as widely investigated as have canned or fresh, numerous bacteriological studies have been made. The relatively few studies that have been made upon dried fish and meat, and the larger number on dried milk have been ably summarized by Tanner.[1] It should be noted that the drying of fish and meat is, as a method of preservation, usually augmented, if not eclipsed, by the use of the preservatives, salt or smoke. It should also be noted that salt and some of the components of smoke are admittedly toxic by themselves or when consumed in sufficient amount, but when used in the customary manner are regarded as entirely innocuous and even desirable by consumers and health authorities. A preservative is also used in the drying of fruits and this introduces considerations that will be discussed in some detail. In the drying of milk, eggs, and vegetables on the other hand, chemical preservatives are not used.

Comparatively little bacteriological study has been made of dried fruits and vegetables. Most of this has been done by Prescott[2, 3, 4, 5] and his coworkers, and by Fellers.[6] As a rule only small numbers of organisms have been found when the products were in good condition, and these were of harmless types. A tendency for the organisms to die off on prolonged storage has been observed. While but little work has been done on the survival of pathogenic bacteria the indications are that danger in this respect is remote.

* Read before the Food and Nutrition Section of the American Public Health Association at the Sixty-third Annual Meeting at Pasadena, Calif., September 6, 1934.

It is presumable that the drying process itself as well as the treatments that often precede or follow it tend to kill microörganisms. A brief description of the drying methods for fruits and vegetables, together with reference to investigations made, may justify this statement. Of the comparatively small quantities of vegetables now being dried in the United States, all are dehydrated for periods of 6 hours or more, and the products are usually exposed for 1 hour or longer to temperatures of 150° F. or above.

The best dehydrated vegetables are steamed for 1 to 3 minutes before dehydration, though some are dried raw; none are sulphured. Among fruits only seedless raisins are customarily sun dried without some treatment with steam, hot water, or sulphur dioxide before or after drying. A few raisins are dipped in boiling lye solution before drying, and a few are both lye dipped and sulphured, followed by sun drying or dehydration. While seeded raisins are sun dried without pretreatment, the seeding process involves first dehydration, then treatment with boiling water or steam. Some figs are sulphured before sun drying, most are dried in the natural condition, but all types are ordinarily processed in boiling water for 1 to 4 minutes just before packing. Apples are sulphured and evaporated at temperatures usually exceeding 150° F.; many are later moistened and resulphured when packed. Prunes are dipped in boiling lye for a few seconds before sun drying or dehydration. When packed they are processed in boiling water for 2 to 5 minutes. Apricots, peaches, and pears are sulphured, then sun dried, and they are washed and resulphured when packed. Only the "natural" seedless and cluster raisins are packed without undergoing some more or less bactericidal treatment.

Of course there is no reason to suppose that any of the treatments given to fruits and vegetables before, during, or after drying result in complete sterilization of the products. However, the general knowledge of time-temperature relations in the killing of microörganisms indicates that considerable reduction of the number of viable organisms may be expected from a few seconds' dip in boiling lye solution, a few minutes of exposure to boiling water or steam, a few hours in air at 140 to 160° F., or a few days of exposure to direct sunlight and temperatures of 120° F. or above.

The exact conditions employed by Fellers [6] in pasteurization experiments are not met in the usual drying and packing processes, but the total counts observed by him in commercially packed American dried fruits compare favorably with the number of organisms found on pasteurized dates and figs. The writer has observed [7] spoiling of unprocessed prunes at moisture contents as low as 18 per cent by yeast-like (as yet unidentified) organisms, while processed prunes did not spoil at moisture contents less than 22.5 per cent; all samples were held in sealed glass jars except when portions for chemical examination were removed. One explanation for this is thought to be that fewer viable organisms remained on the processed fruit, although this was not determined. As evidence of the bactericidal effect of sulphites, Cruess and Berg [8] have found that 1,500 p.p.m. as SO_2 prevented fermentation of grape must for 2 years; this concentration is below that in many sulphured dried fruits. Also repeated attempts to isolate from adequately sulphured dried fruits microörganisms which had evidently been active before sulphuring have been unsuccessful at this laboratory. On the other hand molds growing on dried apricots containing SO_2 to the extent of 315 p.p.m. have been subcultured without difficulty. Molds have

been observed growing on dried pears containing 700 p.p.m. SO_2. The last 2 cases represent instances of failure to give adequate sulphuring, which will be discussed below.

From the point of view of sanitation, it is unfortunate that in the United States fruits are not dried by dehydration as commonly as are vegetables. Because of the higher temperature employed and the reduced opportunity for contamination, dehydration is to be preferred to sun drying. Among fruits, however, only apples are generally dehydrated or evaporated. About 30 per cent of the prune crop of the country is dehydrated, about 7 per cent of the raisins, and only a negligible portion of the other fruits. A trade preference for sun dried apricots, figs, peaches, and pears exists, and the cost of sun drying these fruits is lower. For sun dried fruits the practice of processing by hot water or washing and resulphuring is desirable not only for cleanliness and improving the appearance of the products, but also for sanitary considerations.

The composition of fruits and the manner in which dried vegetables and most dried fruits are prepared for consumption are additional safeguards. The high acid and low protein content of fruits renders them unfavorable for the growth of most pathogens or the elaboration of toxins. Most dried fruits are cooked before they are eaten; dates, figs, and some raisins and prunes are exceptions. Of these, figs and prunes, as noted above, are processed in boiling water at the time of packing. The texture and flavor of dried vegetables render them unsuitable for use without cooking.

Dried fish and meat are for the most part cooked for consumption; when not cooked the preservatives used offer some protection. Dried eggs are practically always cooked. Dried milk is not always cooked and, since no preservative is used in drying, the need for using safe milk in drying is apparent.

Dried fruits and vegetables are sometimes fumigated once or more to prevent development of insect infestation. Formerly hydrocyanic acid gas was used for the purpose, but at present this fumigant has been largely displaced by less toxic agents. According to the report of Williams [9] the possibility of poisoning from fumigated dried foods, even when HCN is used, appears to be negligible.

On the whole, the public health record of dried foods is remarkably clear. The almost complete absence of food poisoning or infection cases in which dried foods have been involved indicates that they are among the safest forms of food. In an outbreak attributed to pudding made from dried peas [10] there is evidence that contamination of the food took place after it was cooked. Two cases of poisoning from codfish cakes were investigated [11] and the causative organism identified, but the channel of infection was not traced; it seems possible if not probable that the contamination here also took place after cooking. An outbreak of colitis was traced to repacked dates [12]; here the culpability of the dried product seems established. Fifty-two cases of botulism have been reported from Russia [13] of which about half were attributed to salted, dried, or smoked herring, salmon, or sturgeon eaten without cooking.

If this is a fair summary of the case against dried foods, considering the international nature of trade in dried fruits and the unsanitary methods sometimes used, they do not appear to be a serious health hazard. In this country the increasing use of machine-filled small containers and pasteurization offer increased protection to the public.

It is not claimed that the possibilities of infection or intoxication from dried foods in general have been covered in

this discussion. As a matter of fact, the chief interest and almost the whole experience of the writer has been in the problems that surround the drying of fruits and vegetables. In view of the failure of dehydrated vegetables to fulfil the promise of commercial development held forth by the stimulation if not creation of this industry during the World War, it may be well to dismiss dried vegetables also with the few remarks that have already been made.

There is a matter involved in the drying of fruits that seems to merit more extensive treatment than has usually been accorded it. There has been considerable discussion of it based upon prejudice or presumption, but the facts appear to have had more of avoidance than treatment. The point in question is the use of sulphur dioxide or sulphites in the drying of certain fruits, chiefly apples, apricots, peaches, and pears.

Sulphur dioxide is a chemical preservative. If it is to be used it must meet certain conditions from the standpoint of regulatory requirements. As used it must not endanger the health of the consumer, it must not be used for the purpose of concealing inferiority of the product, and it seems fair also to require that it be not used in amounts beyond those necessary to accomplish the purpose at hand.

The investigations of Rost and Franz [14] and perhaps those of Wiley [15] indicate that the ingestion of sulphites or sulphurous acid alone or in sufficient quantity produces toxic effects. On the other hand, the unpublished investigations carried out at the instigation of the U. S. Bureau of Chemistry between 1909 and 1914, and the more recent work in Germany reported by Flury,[16] indicate that when consumed as a constituent of dried fruits, even in abnormally large amounts the preservative is without harmful effects. Flury compares the effects of sulphites to those of acetic acid, and points out that the presence of sugar or pectinous materials with which the sulphites may be combined in the food appears to protect the body against harmful effects. The American Medical Association in an official publication [17] has recently declared sulphites in dried fruits to be entirely harmless. As Flury points out, the constant use of sulphured fruits for years by the public and in hospitals and other institutions with close medical supervision has been attended by no discernible ill effects.

As to the second requirement it can be said that sulphur dioxide neither is, nor can be, used to conceal inferiority of dried fruits, if by that is meant the presence of decomposition or decay. It is true that high sulphur dioxide content will permit dried fruits to be held without spoilage at higher moisture contents than is possible without it. Existing tolerances set up by the U. S. Food and Drug Administration for moisture content in dried apples, apricots, and peaches appear to provide adequate protection against such an abuse, if it exists.

Approach to the third phase of the regulatory problem of the permissibility of sulphur dioxide may be made by asking the purpose of using this preservative and the amount required. The primary purpose is to preserve as far as possible the natural color of the fruit. The quantity required cannot be stated so simply, for it depends upon the degree to which the color needs to be preserved and is associated with other essential characteristics of the fruit, as well as upon the time for which the conditions under which the color is to be preserved. The work of Chace, Church, and Sorber,[18] of Nichols and Christie,[19] and many unpublished observations of the writer indicate that the best obtainable retention of color in California dried apricots is not consistently attained if the sulphur dioxide content is below 1,000 p.p.m.; commonly 2,000

or more are necessary and in some districts as much as 3,000 p.p.m. The usual method of sulphuring in California is to expose the cut fruit on trays to the fumes of burning sulphur in more or less tight sulphur houses. When this method is used, the amount of SO_2 absorbed by the fruit is not readily controllable within about 500 p.p.m. Nichols and Christie [19] have shown that dried peaches and apricots lose half or more of their sulphur dioxide content when held in common storage for 6 months. It is also known that half or more of the sulphur dioxide disappears during cooking of the fruit. Nichols and Reed [20] in experiments with dried fruits originally of excellent color have shown that on storage the color of dried apples deteriorated so greatly that the fruit was regarded as unmerchantable when the sulphur dioxide content fell to about 200 p.p.m. A similar change took place in apricots and in pears at about 500 p.p.m. Therefore to provide for variations in season and district and for a factor of safety in case of prolonged storage, amounts of sulphur dioxide between 2,000 and 3,000 p.p.m. certainly do not appear beyond the range of necessity for apricots, peaches, and pears. Apples do not readily absorb these amounts, and require less for satisfactory retention of color.

In addition to its effect on color retention, its action on some of the vitamins is also pertinent. Morgan and Field [21, 22] and Morgan, Field and Nichols [23, 24, 25] have observed in the dried fruits they have studied that sulphur dioxide has a destructive effect on vitamin B (B_1), does not affect G, notably improves the retention of A, and appears to be essential if any C is to be retained. The preservative protects C through cooking as well as drying and storage. The fruits that are regularly sulphured were found to be relatively poor sources of B but are among the richest sources of A and C. The minimum amount of sulphur dioxide necessary to preserve C was found to be about 500 p.p.m. This is of interest in reference to the observations of Nichols and Reed as to color deterioration, and to those of Joslyn, Marsh, and Morgan,[26] who found a simultaneous loss of vitamin C and darkening of color in orange juice.

In press reports [27] relating to the work of Balls and Hale of the Bureau of Chemistry and Soils, Washington, D. C., pineapple juice, cysteine, and glutathione have recently been suggested as substitutes for sulphur dioxide in fruit drying. Since these reports were made time has not permitted a careful study of the possibility of using these substitutes in the drying of apricots, peaches, and pears, which apparently had not been tried. Preliminary trials observed by the writer have been rather disappointing and it appears doubtful whether the substitutes will prove adequate.

Until such time as adequate substitutes be found it may well be asked whether the existing regulations pertaining to sulphur dioxide should not be revised. In various foreign countries the tolerances for sulphur dioxide in dried fruits range from 0 to 2,500 p.p.m. Some countries set no limit. In the United States the federal government has no defined limit, but several states have restrictive tolerances or permit none. The maintenance of some of the existing tolerances or the setting up of new restrictions that would not permit the retention of satisfactory color in cut dried fruits would appear to lead toward exclusion of these foods from the diet. In view of their excellent nutritive values, their low relative cost, the seemingly well established harmlessness of the preservative, and the protection it affords against infective agents and vitamin losses, it would seem that uniform and liberal regulations regarding its use would be desirable.

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The American Red Cross

Roll Call from Armistice Day to Thanksgiving

Practical Application of School Health Principles*

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THE School Health Research of the American Child Health Association has developed certain principles of procedure as conducive to more efficiency in school health programs. These principles have been thoroughly discussed in the Fifth Monograph of the School Health Research Series [1] and in the New York City study, *Physical Defects—The Pathway to Correction* [2] which was financed by the Metropolitan Life Insurance Company.

I have had an opportunity during the past year to experiment with the practical application of these principles in a school system that is fairly typical of many well managed schools. I was the only school physician and had the assistance of 1 nurse in a system of about 2,000 elementary school children and 1,500 junior and senior high school pupils. I shall discuss the way we applied some of these principles to the health program in our 5 elementary schools. While our efforts were divided with the demands for service and health education in the high school, our experience in the elementary schools offers the most direct application of the principles which came from the research.

We find in the monograph, *An Evaluation of School Health Procedures*, that certain activities characterized as indicating team work between the nurse and teacher actually produced results. That is, in schools where there was a good nurse-teacher rapport, there we found the best results in the children. Obviously this is a sensible principle but research evidence of its importance leads us to extra efforts to apply it.

We have found in Freeport that nurse-teacher rapport can be developed if the nurse responds *thoroughly* to all requests of the teacher for advice, examinations, and follow-up of her children. When the teacher says she thinks Johnny may have some trouble with his eyes which handicaps him in his school work, an examination is made as promptly as possible, the report is made to the teacher, the observations of the teacher are noted for advising the parents, and the follow-up is consistently reported *back* to the teacher.

I am convinced a large part of the trouble with obtaining the teacher's interest is the failure to take seriously enough such observations as the teacher supposes are significant. Teachers too often feel that their observations have no significance to the nurse and physician, or that they are not sufficiently encouraged to propose further problems. Therefore, we consider almost no work has preference over a thorough investigation and follow-through of every problem proposed by teachers.

Considerable ground work along this

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line had fortunately preceded me in Freeport. Miss Derrick, our school nurse, had been shrewd enough to recognize that she could accomplish little in follow-up without the fullest teacher coöperation. She had discovered that the annual accumulation of records of physical defects for follow-up were overwhelming if she attempted thorough follow-up upon all of them. The sick child who failed to obtain medical attention, the toothaches, the tonsillitis, acute cervical adenitis, and all the neglected cases referred by teachers were obviously children deserving precedence in her follow-up program. She served the teachers and the teachers responded to her efforts. She soon discovered that her interest in the teachers' questions resulted in further consultations by teachers and reference of more children with neglected health conditions. She realized that the numerous tonsil defects listed by the school physician were not all urgently in need of medical care, and not all could obtain treatment, so she focused her follow-up upon the more serious cases of medical neglect referred by the teachers. And yet there were plenty of tonsillectomies. We found this year that 50 per cent of the 5th and 6th grade children have their tonsils out. But her efforts for tonsillectomy were focused on the really serious cases with medical history indications of need for tonsillectomy.

During the past year we have extended this nurse-teacher rapport as well as a doctor-teacher rapport, not by any peculiar personality influence upon the teachers but merely by applying methods that any nurse can apply. We ask the teachers to observe selected children for eye symptoms. We ask for observations of mouth breathing, for a check up and report of which cases go to a dentist, and which cases obtain tonsillectomy, glasses, or other medical care.

These supposed burdens are put upon the teachers with no complaint from them that they have too much to do; nor do we find that the teacher is not interested. Our teachers are burdened with as heavy a load as those anywhere but they are also interested in doing what they can for the neglected child. A question of the teacher about an individual child's behavior in school or about his psychological reactions in study and play invariably arouses her interest as to the possibility that the removal of physical handicaps may accomplish what she would like to do for the child.

While the teacher is not uninterested, a long list of physical defect symbols after the names of her pupils is certain to leave her cold and uncoöperative. We avoid heaping up too many defect findings for the teacher to interest herself in by the manner of the examination.

We test (1) vision on one visit; (2) hearing on another; (3) teeth are examined at another; (4) when a classroom inspection is made for a check-up on skin and pediculosis or contagion, other conditions are noted for the teacher's observation and report: (5) the more obvious cases of malnutrition may be selected for special observation, or we may advise the teacher as to ways in which she can coöperate in the follow-up; (6) on another occasion the child may have his throat, glands, heart, and other parts examined.

These are screening devices, and I shall say more about the examination later; but I would emphasize that a few cases at a time thoroughly discussed with the teacher invariably arouses her interest and brings forth a willingness to observe, report, and otherwise assist in follow-up. Such discussions with the teacher provide ideal opportunities for instructing her in fundamental subject matter for health education.

We are convinced from our experience this year that the principle of rapport among all the school health personnel as presented in the School Health Study and the New York City Study is not only a valuable asset in obtaining the correction of physical defects but is absolutely essential if we are to make our advice to parents regarding the need for medical care reasonably effective. It is essential if the medical examiner is to consider the history and behavior of the child from one who has observed it. It is the only way that we can get the teacher to understand the needs of her pupils. Certainly an understanding by the teacher of the physical defects of her pupils is necessary if she is to build respect for medical attention and if education is to lead toward a wiser use of community medical resources. No doubt many cases of medical neglect result from a lack of understanding of child needs by parents. Not all parents of children in need of medical care can possibly be visited for effective education by the nurse, but with the teacher's help cases can be selected with discrimination so that personal conferences can be arranged whenever an explanation to the parent will be profitable. Continued follow-through is essential for successful follow-up and this can only be attained with the teacher's interest.

A second principle which came out of the school health research which was associated with good results in the children, was the need for a thorough and adequate examination of the children. This is expressed in the New York City report as, "There should be accurate detection of defect cases with economy of effort," and a corollary of this principle is "The home visit should be backed by authority." In other words, before we launch forth the nurse on the expensive and time consuming follow-up of home visits or indeed any conferences with parents, we should be sure that the record of defect is truly a defect needing attention. The study in New York indicates clearly that the selection of cases for follow-up had not been made on any such accurate basis. Many cases were missed and many cases were wrongly selected for follow-up. I am confident from experience on numerous surveys and contacts with school health services that a similar degree of inaccuracy in the detection of defect cases prevails in most cities offering school medical and nursing service.

Better examinations have been recognized as desirable for a long time, but only recently has it been clear that it was not practical to supply thorough and adequate health examinations for every public school child every year. My experience in Freeport has given me confidence that such tests as were developed by the School Health Research of the American Child Health Association combined with rapid inspections by a physician can be used as screening devices to select a limited number of cases so that more time can be given to the cases most likely to be in need of attention.

We have used a modified Snellen test devised in the School Health Study for testing visual acuity with increased confidence in its practicability and accuracy as a screening device. It can be used by a technician without medical or nurse training. We ask the children about eye symptoms at the time of the testing; observation is made of blepharitis, inflammation of the conjunctiva and sclera, and cases showing any suspicion of symptoms or inflammation are recorded for observation. Cases for observation are listed for the teacher to observe before initiating follow-up. While not all such selections have sufficiently serious symptoms to justify follow-up, the listing of the cases and the resulting conference with the teacher is very effective in training

the teacher to observe her pupils for eye symptoms, and such teacher observations bring about the discovery of many cases with normal visual acuity who suffer eye strain.

A well trained technician selecting visual acuity cases of 20/40ths or worse can be depended upon to give authority for follow-up. However, before we make the home visit, a conference is held with the teacher for two reasons: (1) to enlist her assistance in a check-up as to whether the child gets an examination by his oculist or whether he goes to a clinic; (2) to get ammunition in order that the nurse may talk with the mother about her individual child. Symptoms observed by the teacher as well as knowledge of the child's progress in class work and behavior are always of interest to parents, and a definite account about a particular child makes the advice to seek medical care effective.

In the 4a Audiometer accompanied by the 2a Audiometer we have another screening device suitable for operation by a technician so that the physician can have time to give the kind of examinations that he is trained to give rather than the kind of march-by examinations so common in public school practice. The phonograph records for this instrument, however, should be improved for greater accuracy. There seems reason to expect that the Bell Telephone Laboratories with the help of the research of the School Health Study will make it possible for us to use this instrument so that we may rapidly and accurately select all hard of hearing pupils.

The New York City Study as well as the monograph, *Physical Measures of Growth and Nutrition*[3] has clearly demonstrated that physicians cannot make satisfactory selections of undernourished children under the single examination scheme of school examinations. No doubt extreme cases can be selected, but such cases are on the average considerably less than 5 per cent. The 10, 15, and 20 per cent ordinarily selected are not proper selections and a better selection is necessary if we are to do anything with malnutrition among school children. The ACH index is a suitable preliminary screening device. But before we initiate follow-up, further measurements of the screened cases are needed to obtain the children underweight for 4 skeletal dimensions and also those with small sized musculature and small amounts of adipose tissue in proportion to their body build. By screening we are able to limit the number requiring thorough examinations so that we can use the complete physical measurements and a clinical history. Such examinations give confidence that we have selected the cases most likely to be in need of medical attention for malnutrition.

I have not been able to try out this plan thoroughly in Freeport because we were not prepared to give adequate follow-up for any large number beyond the possible underfed cases that were under severe economic stress due to unemployment. We have not yet succeeded in selling to our school authorities the idea that the employment of a technician is good economy. We were, therefore, limited in the number of cases that could be measured. We had the services of two CWA workers for several months for follow-up under a trained nutrition worker through the efforts of the County Medical Society. This assistance enabled us to check the food selected by the families on relief and to advise on the buying of food to improve diets in the most needy cases. The school children in these families were all measured and thoroughly examined so that special recommendations for supplementary food for the undernourished children were made to the Relief Authorities. This plan of handling unemployment malnutrition

has been consistent with the principle of "Accurate detection of defect cases with an economy of effort." The selection of the cases under economic stress as the cases for whom we could offer effective follow-up enabled us to provide complete measurement and examination with a clinical history before follow-up was initiated.

A symposium last June at the meeting of the American Academy of Pediatrics was unanimous in agreeing on the importance of the clinical history for deciding on the need of tonsillectomy. While as School Medical Adviser I never advise tonsillectomy, I do have a responsibility not to increase the number of unnecessary tonsil operations, and I cannot say that a child is in need of attention for tonsils without a clinical history except in the very few cases with obstruction or extreme infection.

To screen out the cases most likely to need attention we rely heavily on the teacher to obtain a history. Every absence from school requires an excuse. This year we asked the teachers to distinguish sickness absence from other absences on their reports. Next year they will report the kind of sickness suffered by the child. While accurate diagnosis of every absence case may not be attained, frequent absence due to sickness is a clue to initiate an investigation to confirm the character of the illness. Cases with recurrent sore throat, cervical adenitis, and rheumatic fever are selected for confirmation and then are recommended for tonsil attention.

If the case is likely to go readily to the family physician, we suggest to the parents that they seek their own physician's advice. A child from a family who cannot afford a physician gives us an even greater responsibility for selecting only the cases that can truly profit from medical care. This means in most cases selection of the cases needing tonsillectomy. The cost of follow-up and the cost of medical care supplied by the welfare agencies demands that we select cases with real indications for tonsillectomy and not place this responsibility for selection entirely upon the physician employed by the relief authorities. In many cases this requires observation and reëxamination and investigation of the history in the same way as the pediatrician does in his private office. With 50 per cent or more children being operated upon our concern should be for a wise selection of cases recommended for medical attention and not for more tonsillectomy.

Our screening procedure is, first attention to the cases referred by teachers, then to all cases with a tonsil history as shown by the sickness absence reports, and, finally, we search for suspicious cases by rapid throat inspections and refer these for observation and for report from the teacher—giving her specific advice as to what to be on the lookout for.

A third and one of the most important principles came from the New York City study. That is "The available correction facilities should be considered in determining the severity of a selection for follow-up." Of course there is no point in discovering defects year after year if we cannot do anything about them. Only the most intelligent parents respond to a form notice with no other follow-up. Such parents generally obtain sufficient medical care so that school advice is not often needed, except for vision defects. In order that the nurse may be thorough and not be swamped by an excess of cases both serious and not so serious, we consider her follow-up load in selecting the cases for her to follow up.

All follow-up is graded as to the seriousness of the need. This grading is the responsibility of the physician who makes the final decision for follow-up. Our nursing service is adequate for the worst cases and, as we

improve our teacher interest and improve the efficiency of our record keeping and check-up, we can follow up many more cases. We list our cases: first, as urgent, and second, as suitable for advising parents if and when we are able, and third, as suspicious cases for observation and follow-up when definite indications are confirmed as to the need for medical care. When the nurse clears up the urgent cases, she starts on those less urgent; and as we progress we intensify our search for other less apparent needs, working up the cases under observation. This of course requires close team work between the nurse and the physician. The nurse notifies the physician as she clears up the urgent and less urgent cases so that he may have time for a check-up on teacher observations, sickness absences, and such reëxaminations as are necessary to discover other conditions deserving follow-up.

The small number of neglected defects from the more intelligent and well-to-do families generally require little time for follow-up because a tactful telephone conversation generally results in prompt reference to the private physician, and no limitations are met as to medical facilities. On the other hand, we are limited as to free service and we must know how many cases our clinics can handle each week if we are to care for our worst cases first.

In Freeport we very early reached our limit in the facilities of the community free dental clinic. We then arranged a system of appointments for extraction and sent the clinic only the worst abscessed teeth cases, and began our campaign for an increase in facilities to meet the need for serious dental infections. I think we have about solved the problem of neglected abscessed teeth.

Likewise we have met a limit in the facilities for free refraction and glasses and must face next year the problem of caring for a larger number unless the unemployment situation improves greatly. A great deal of time and thought is required to keep clear the coördination of our facilities for medical relief with our efforts in finding the children in need of medical care, and with the follow-up load of the nurse.

I have not time for a discussion of live records that do not require a full-time book-keeper. We have made some progress but further experimentation is needed.

Other administrators may apply these principles using other methods, but I am confident no school health program can give reasonably adequate attention to the medically neglected children without an extravagantly large and expensive staff unless they develop nurse-teacher rapport, use screening devices for selecting children so that their physician may give adequate time to clinical considerations, and coördinate the examination findings with the follow-up and medical care facilities.

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Experience With Alum Precipitated Toxoid in Virginia and Observations on the Reaction Following Its Use*

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SINCE the introduction of alum precipitated toxoid, numerous workers have reported observations indicating that it is efficacious in the production of active immunity to diphtheria. Experience of most of these observers has shown that over 90 per cent immunity in originally Schick positive individuals may be expected following the use of a single dose of alum precipitated toxoid. A single dose of toxoid has the advantage of subjecting the patient to but a single unpleasant experience and saving time and expense, thus making the universal use of a diphtheria preventive more practical. Since the experience with alum precipitated toxoid is not yet very large, certain questions and possible objections to its use should be considered. First, does a single dose of commercial alum precipitated toxoid in routine use produce a high percentage of immunity to diphtheria? Second, is the immunity produced by alum precipitated toxoid (as measured by the Schick test) durable? Third, are the reactions following the use of alum precipitated toxoid of sufficient severity to limit its use?

Recently a study has been carried on in Virginia in an attempt to answer these questions. In order to determine the efficacy of alum precipitated toxoid in the routine immunization of children, groups representing both urban and rural populations, white and colored races, and as wide as possible variations in diphtheria experience have been studied. Seventeen hundred and sixty-five Schick positive individuals were given one dose of 0.5 c.c. or 1 c.c. of alum precipitated toxoid of a potency of from 12.5 to 31.5 flocculating units per c.c., and retested 2 months later; 94.4 per cent of these were found to have been rendered Schick negative. A similar group of 347 were treated the same way but not retested until the end of the year; 95.1 per cent of these were Schick negative.

Table I shows the Schick reaction of these two groups of individuals by age groups and color. The difference between the negro and the white population is significant. This would indicate that artificial active immunization of the negro race against diphtheria is slightly more difficult than the immunization of the white race, a fact which we are unable to explain. There is no significant difference in the efficacy of alum precipitated toxoid in the various age groups nor is any sex variation noted. Four hundred and

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TABLE I

SCHICK REACTION OF ORIGINALLY SCHICK POSITIVE INDIVIDUALS AT THE END OF 2 MONTHS OR 1 YEAR FOLLOWING THE ADMINISTRATION OF 1 DOSE OF ALUM PRECIPITATED TOXOID

Age	After 2 Months				After 1 Year			
	Number Tested		Per cent Negative		Number Tested		Per cent Negative	
	White	Colored	White	Colored	White	Colored	White	Colored
0– 4	15	3	100.0	100.0	10	5	100.0	100.0
5– 9	507	383	95.9	93.0	146	43	96.6	83.7
10–14	446	317	96.9	91.2	76	29	96.1	93.1
15 +	58	36	94.8	86.1	35	3	100.0	100.0
Total	1,026	739	96.3	91.9	267	80	97.0	88.8

eighteen of those included in the group re-tested at the end of 2 months had at some time been given some form of diphtheria immunizing treatment, while 1,347 gave no history of any previous immunizing treatment; but no significant difference can be shown in the efficacy of alum precipitated toxoid in these two groups. In brief, our experience is that no matter what the previous treatment, age, sex, or color of a group has been, 1 dose of alum precipitated toxoid renders over 90 per cent of them Schick negative for at least a year.

In order to compare the durability of the immunity produced by alum precipitated toxoid with naturally acquired immunity to diphtheria and with the immunity produced by other diphtheria immunizing agents, a group of 1,636 Schick negative individuals were re-tested at the end of one year. This group is made up of 550 Schick negative individuals who gave no history of previous immunization, 519 who gave a history of previous immunization, 225 originally Schick positive and rendered Schick negative at the end of 2 months by a high potency toxoid furnished by

TABLE II

REVERSION OF SCHICK NEGATIVES IN 1 YEAR

	Positive	*Total*	*Per cent showing reversion*
Originally Schick negative— With no history of previous immunization	36	550	6.5
Originally Schick negative— With history of previous immunization	24	519	4.6
Originally Schick positive— Rendered Schick negative by Park's toxoid	10	225	4.4
Originally Schick positive— Rendered Schick negative by alum precipitated toxoid	19	342	5.6
	89	1,636	5.4

Dr. W. H. Park, and 342 originally Schick positive rendered Schick negative at the end of 2 months by alum precipitated toxoid. Reliable information as to the immunizing agent given the 519 Schick negative individuals who gave a history of previous treatment was difficult to obtain but it is known that most of these received toxin-antitoxin.

Table II shows the reversion of these various groups of Schick negatives in one year. The differences in per cent showing reversion are not significant, indicating that the durability of immunity produced by alum precipitated toxoid is not less than that which is produced by natural causes or by other diphtheria immunizing agents.

The potency of the alum precipitated toxoid used in this study varied from 12.5 to 31.3 flocculating units per c.c. and the dosage of toxoid was either 0.5 c.c. or 1 c.c. Eight hundred and fifteen individuals, including both white and colored, were given 0.5 c.c. of a toxoid containing from 12.5 to 17.3 flocculating units per c.c., while 950 were given 1 c.c. of toxoid varying in potency from 12.5 to 31.3 flocculating units per c.c. Though the differences in the immunity produced by the two dosages are not significant, the percentage rendered Schick negative by the larger dose is consistently higher. While this study was being carried on, we had the opportunity of observing with Dr. W. A. Browne of the Richmond City Health Department, a group of 250 originally Schick positive children who had received one dose of 1 c.c. of alum precipitated toxoid containing 3.5 flocculating units per c.c. Only 69 per cent of this group of originally Schick positive individuals were rendered Schick negative by this low potency toxoid. It seems, therefore, that the optimum potency of alum precipitated toxoid lies somewhere above this level.

As there has been considerable apprehension concerning the reactions following the administration of alum precipitated toxoid, an attempt has been made to determine the severity of reactions, both local and systemic, following its use. A group of 353 individuals mostly of preschool and school age, have been observed following the administration of alum precipitated toxoid. All were originally Schick positive and were given 1 c.c. of toxoid ranging in potency from 18.1 to 29.7 flocculating units per c.c. The temperature of each individual was taken before the administration of toxoid and again at the end of approximately 24 and 48 hours. The history of each individual was taken at the end of 24 and 48 hours and the local and systemic reactions observed and recorded, and

TABLE III

PER CENT OF INDIVIDUALS SHOWING CERTAIN SIGNS AND SYMPTOMS FOLLOWING THE ADMINISTRATION OF ALUM PRECIPITATED TOXOID

Age	Number Observed	Per cent showing reaction	Local Reaction Per cent Showing			Systemic Reaction Per cent Showing						
			Red Area	Soreness and Tenderness	Swelling	Malaise or Headache	Nausea	Vomiting	Increase in Temperature			
									1°–1.9°	2°–2.9°	3°–3.9°	4°–4.9°
0-9	203	67.5	41.4	17.2	7.4	10.3	3.4	3.0	25.6	7.9	2.0	1.5
10+	150	72.7	51.3	24.7	16.0	15.3	3.3	4.0	32.7	13.3	1.3	2.0
Total	353	69.7	45.6	20.4	11.0	12.5	3.4	3.4	28.6	10.2	1.7	1.7

all individuals having either local or systemic reactions were observed daily until all symptoms had subsided.

It will be noticed that 69.7 per cent showed some reaction either local, systemic, or both, and that the older ages consistently have a higher percentage showing each symptom indicating that their reaction is more marked. A local red area and an increase in temperature are the most common symptoms.

local reaction was considered to be one in which there was a large, red, indurated area with soreness, tenderness, swelling, and local heat. A mild systemic reaction was considered to be one in which there was from 1 to 2 degrees of temperature elevation with no other symptoms, or no temperature elevation with a single mild symptom. A moderate systemic reaction was considered to be one in which there was an elevation of temperature of more than

TABLE IV

OBSERVATION ON THE REACTION FOLLOWING THE ADMINISTRATION OF 1 DOSE OF 1 C.C. ALUM PRECIPITATED TOXOID

Age	Number Observed	Per cent Showing			
		No Reaction	Local Reaction Only	Systemic Reaction Only	Local and Systemic Reactions
0– 9	203	32.5	23.2	19.2	25.1
10 +	150	27.3	20.7	14.7	37.3
Total	353	30.3	22.1	17.3	30.3

Table IV shows the relative frequency of local and systemic reactions. It is seen in this group that 30.3 per cent showed no reactions, either local or systemic; 22 per cent showed local reaction only; 17 per cent showed systemic reaction only; and 30 per cent showed a combination of local and systemic reactions.

An attempt was made to classify the severity of both local and systemic reactions into classes of mild, moderate, or severe. A mild local reaction was considered to be one in which there was a local red area less than 5 cm. in diameter, with or without slight soreness or tenderness but showing no other local symptoms. A moderate local reaction was considered to be one in which there was a local area of redness with definite soreness and tenderness with or without swelling. A severe

2 degrees and no other symptoms, or two symptoms with less than 2 degrees of temperature. A severe systemic reaction was considered to be one in which there was an elevation of temperature with headache or general malaise and nausea or vomiting.

Table V shows the correlation between the various degrees of local and systemic reactions. Fifteen per cent showed mild, local and systemic reactions, 4 per cent moderate and 0.3 per cent, or one individual, showed severe local and systemic reactions. Eighty-one per cent of the entire group fall into the classification having either no or mild local and systemic reactions and 19 per cent have moderate or severe local and systemic reactions.

Monroe and Volk [1] have reported a study of the reactions following the administration of untreated toxoid and

TABLE V

CORRELATION BETWEEN SYSTEMIC AND LOCAL REACTIONS FOLLOWING 1 DOSE OF 1 C.C. OF ALUM PRECIPITATED TOXOID

Local Reactions	Systemic Reactions									
	None		Mild		Moderate		Severe		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
None	107	30.3	59	16.7	2	0.6	0	0.0	168	47.6
Mild	67	19.0	53	15.0	14	4.0	4	1.1	138	39.1
Moderate	10	2.8	17	4.8	14	4.0	4	1.1	45	12.7
Severe	0	0.0	1	0.3	0	0.0	1	0.3	2	0.6
Total	184	52.1	130	36.8	30	8.5	9	2.5	353	100.0

toxoid to which 0.2 per cent alum was added. In so far as our observations can be compared with theirs, there does not seem to be a marked difference in the reactions following alum precipitated toxoid and untreated toxoid.

In order to compare more clearly the reactions following the administration of alum precipitated toxoid and untreated toxoid, a parallel series of observations were made on 93 originally Schick positive individuals in which one individual was given 1 c.c. of alum precipitated toxoid and the next 1 c.c. of untreated toxoid. These two groups of individuals are entirely comparable in age and sex. The temperature was taken on each individual before the injection of the toxoid and at the end of 24 and 48 hours afterward. Histories were taken and observations made daily until all symptoms subsided.

Table VI gives a comparison of the per cent of individuals showing certain signs and symptoms following the administration of untreated toxoid and alum precipitated toxoid. No significant difference in the two groups is seen in the per cent showing any reaction. The factors making up the local reactions run almost parallel for the two groups. The per cent showing malaise or headache is high in the group receiving untreated toxoid but the in-

TABLE VI

PER CENT OF INDIVIDUALS SHOWING CERTAIN SIGNS AND SYMPTOMS FOLLOWING THE ADMINISTRATION OF UNTREATED TOXOID AND ALUM PRECIPITATED TOXOID IN A PARALLEL SERIES

Toxoid Administered	Number Observed	Per cent showing reaction	Local Reaction Per cent Showing			Systemic Reaction Per cent Showing						
			Red Area	Soreness and Tenderness	Swelling	Malaise or Headache	Nausea	Vomiting	Increase in Temperature			
									1°–1.9°	2°–2.9°	3°–3.9°	4°–4.9°
Alum Precipitated	50	68.0	52.0	30.0	6.0	2.0	0.0	0.0	30.0	8.0	2.0	0.0
Untreated	43	67.4	39.5	27.9	9.3	14.0	2.3	0.0	27.9	2.3	2.3	0.0

definiteness of this symptom and the small number observed make this difference of little significance. The temperature elevations are almost parallel in the two groups.

ing alum precipitated toxoid are in any way different from the reactions following untreated toxoid.

More than 3,000 children were given a single dose of 0.5 c.c. or 1 c.c. of

TABLE VII

OBSERVATION ON THE REACTION FOLLOWING THE ADMINISTRATION OF UNTREATED TOXOID AND ALUM PRECIPITATED TOXOID IN A PARALLEL SERIES

Toxoid Administered	Number Observed	Per cent Showing Reaction	Local Reaction Per cent Showing				Systemic Reaction Per cent Showing			
			No Reaction	Mild	Moderate	Severe	No Reaction	Mild	Moderate	Severe
Alum Precipitated	50	68.0	52.0	40.0	8.0	0.0	58.0	38.0	4.0	0.0
Untreated	43	67.4	51.2	39.5	9.3	0.0	58.1	37.2	2.3	2.3

Table VII shows the comparison of the local and systemic reactions observed in these two groups, according to the classification of mild, moderate, and severe. This comparison shows a great similarity in the two groups, both in local and systemic reactions.

Table VIII shows the correlation between local and systemic reactions in the two groups. The two groups are indistinguishable in the per cent showing no reaction, local or systemic only, or local and systemic combined. There is no evidence that the reactions following alum precipitated toxoid are in any way different from the reactions following untreated toxoid.

More than 3,000 children were given a single dose of 0.5 c.c. or 1 c.c. of alum precipitated toxoid during this study and only one individual developed an abscess at the site of injection. This occurred in a Schick positive white, female, 11 years of age, who gave a history of previous immunizing treatment with toxin-antitoxin. There was a severe local reaction following the administration of the toxoid with abscess formation on the 5th day. The abscess drained spontaneously and healed rapidly.

Recently in Virginia, a high percentage of abscesses were found follow-

TABLE VIII

OBSERVATION ON THE REACTION FOLLOWING THE ADMINISTRATION OF UNTREATED TOXOID AND ALUM PRECIPITATED TOXOID IN A PARALLEL SERIES

Toxoid Administered	Number Observed	Per cent Showing			
		No Reaction	Local Reaction Only	Systemic Reaction Only	Local and Systemic Reactions
Alum Precipitated	50	32.0	26.0	16.0	26.0
Untreated	43	32.6	25.6	18.6	23.2

ing the use of a single lot of alum precipitated toxoid. All abscesses were confined to those having received toxoid bearing this particular lot number. In a group of 112 individuals receiving 1 c.c. of alum precipitated toxoid bearing this lot number, 12 had abscesses which required surgical attention. Material was cultured from each one of these abscesses and in all instances was found to be sterile. This occurrence was reported to the National Institute of Health for investigation.

Experience with the use of alum precipitated toxoid in Virginia would seem to indicate that abscess formation need not necessarily be expected following its use.

CONCLUSIONS

One dose of alum precipitated toxoid of a potency of 12.5 flocculating units per c.c. or greater produces over 90 per cent immunity in known Schick positive individuals.

There is not a significantly greater reversion to the Schick positive state in individuals rendered Schick negative by alum precipitated toxoid than in Schick negative individuals rendered Schick negative by natural causes or following other diphtheria immunizing agents.

Reactions following the administration of alum precipitated toxoid are not of sufficient severity to limit its use, nor are these reactions of greater severity than those following the administration of untreated toxoid.

REFERENCE

1. Monroe, J. D., and Volk, V. K. *A.J.P.H.*, 24:342–348 (Apr.), 1934.

Medical Slang

WORSE than medical jargon is medical slang. The best type of medical writing is that which appears in the case report. The use of the word "gut" for intestine or the plural of the word for the other contents of the abdominal cavity may be considered a medical affectation quite as bad as "the acute abdomen." When the surgeon says he did a "chronic appendix," when the gynecologist speaks of "an abdominal woman," when the dermatologist "puts the patient on iodides," or when the internist says the patient "runs a swinging temperature," they are speaking medical slang. The gynecologist would hesitate to speak of doing a Caesar when he performs a caesarean operation.

These are some of the specific examples cited by Hurter, and there are many more in *The Art and Practice of Medical Writing*.

In the field of medical science, many men have gained note by their ability to express themselves in good English succinctly, rhythmically and accurately. The opportunity is available, for everyone who cares to take the trouble and the time, to perform competently in the field of medical letters. Experts assert that there are hardly a hundred competent medical writers in our country today; some authorities insist that there are hardly more than 10 or 12. In the field of preparation for sound literary expression, particularly, preliminary education to medical training seems to be failing miserably.—Editorial, *J.A.M.A.*, Sept. 15, 1934, p. 842.

Health Education in Germany*

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IT is a great honor for me to speak to you about Health Education in Germany. If there is anything in which you are specially interested, I hope that I may have an opportunity to answer questions afterwards.

I have no special personal philosophy regarding health; a man is healthy who can perform all the duties required by his nation, his profession, and his family. It is not enough only to be healthy. Those persons living only for their health, as they say (I call them health-hypochondriacs) have not a great interest for the health educator. Such persons have "eine falsche Gesundheit" . . . they do not eat to be satisfied, but rather to obtain the proper amount of calories and vitamins.

One question for a health worker, who does his work on a scientific basis is the following: What can be done by education? What health factors are determined by heredity, and what influence can social conditions have? If health workers would obtain success they must, of course, give consideration to such factors, which I will not take time to discuss here.

About Germany—There is one great difference between this country and my home. Germany is an old country, nearly 2,000 years old in its history. There are many different native racial tribes—Prussian and Bavarian, Silesian, and people from the Rhine, have different hereditary backgrounds. The greatest difference is in regard to the population. The area of the States is 18 times greater than that of Germany. It is better to say that the State of Texas is a little larger than all of Germany, but in Germany there are 66 million people, as compared with 2 million in Texas.

WHAT IS THE AIM OF HEALTH EDUCATION IN GERMANY?

I think there is a new idea of health education since the Great War in those countries which have suffered much through the war and due to its consequences. Millions of people have learned, and have been led to appreciate the value of life, and the value of health.

Health Education in Germany seeks to teach the individual to value life, not to throw it away—to regard it as a trust. To us the aim of education for health is: the healthy man, the man physically and mentally well balanced, who knows and perceives what is beneficial for him, who recognizes health as a most precious gift of life, always worthy to be striven for.

If there is any right of health for every citizen there is also a duty for each to strive for vigorous health. We say in Germany, "Der einselne ist nichts; die Volkgemeinschaft ist alles." To be healthy is nothing—to maintain yourself to work for the national welfare, that is everything.

* Read before the Health Officers Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 3, 1934.

The persons in Germany doing the work of health education are, first, the health officers. There are health officers of the State called "Kreisarzt," and health officers of great towns, "Städtartz." Some rural districts have also county health officers for preventive medicine and health work. The Reich recently adoted a new law "bringing all health work under one sole direction." Now there must be in each town and county a state health officer; formerly it could be, but it did not have to be. In the Reichministerium of Interior there is a special department for health service, including health education.

The second chief-worker in health education is the teacher. I think in many cases the teachers are better trained for health education than the doctors. In Germany the work in health education in the school is done by the teachers. There is another method in England by which the health officer lectures in the school. I do not know how it is in this country.

We should not forget the parents. More important than knowledge about health and hygiene is the education for healthy habits, and that must be done by the parents in the first 5 years of childhood. We have a German proverb, which is, "Was Hanschen nicht lernt, lernt Hans nimmermehr." "What little Jackie does not learn—adult Jack would never learn." We have so-called "Mutterschulen" and there are special evening classes where the fathers come also. Home nursing not only requires a kind heart, but also a clever hand and a clear head. People are seldom born with these qualities, but with proper instruction they can easily be acquired by most men and women.

We have in Germany a law which requires the registration of tuberculosis and venereal diseases. If any person is ill of one of these, the doctor must give the patient's name to the health officer who gives the sufferer and his family special instructions about the sickness, how to cure it, and so forth. Our new state laws provide a great opportunity for personal work in health education, especially in eugenics—not to forget the Health Insurance Institutions and many private organizations dealing with alcoholism, tuberculosis, and venereal diseases. There are also special institutions in Germany, "Die Berufs Schule." These are of great importance in our health education work. Boys and girls from 14 to 17 have to learn many things about health; for example, the instruction given to girls, how to nurse the babies. The German Arbeidtsdienst, similar to your CWA, is one of the best opportunities for adult education between 18 and 25. They are given gymnasium each morning, swimming, hiking, and so forth, with instruction in first aid. In Germany we have such organizations for girls also, but they are voluntary.

The methods of Health Education are, I think, quite the same in Germany as in your country. More and more we prefer intensive work between individual and individual. We have also extensive health campaigns—but we do not believe much in their success. You can give great figures of how many millions of pamphlets you distributed and make a good impression on laymen, and from time to time it is valuable to have big exhibits. I must tell you a little story. We had a great hygiene exhibit in Dresden, 1930–1931. Several days we looked around with the well known Mr. and Mrs. Routzahn. One day he asked: "Would it not be better to have a smaller exhibition than a big one?" "Yes," I said, "but we had 10 small ones and no Mr. Routzahn came from America to see them, but now we have the big one and Mr. Routzahn has come to Germany."

The means of Health Education are so many that it is not possible to speak now about them. The best is the

spoken word—from individual to individual. Our medical practitioners have almost forgotten it. An old medical sage says: "You can cure a man by remedy and by word." I think there must be more educational work by the medical practitioners. You cannot help a man alone by giving him a prescription, or doing an operation.

The printed word, pamphlets, books—We need them but they have not so great an influence. Better are pictures, lantern slides, films. We prefer lantern slides for instruction, and films for health propaganda.

THE WORK OF THE DEUTSCHES HYGIENE MUSEUM

Our Museum was founded in 1912. The year before the first International Hygiene Exhibition was opened at Dresden. This exhibition was the pioneer in giving hygienic instructions to the masses of the people. In 4 months more than 5½ million visitors saw the exhibition. The greatest success was the department, Der Mensch (Man). Since then the Museum has steadily developed into a central institution for public health. The new home of the Deutsches Hygiene Museum was opened in the year 1930. Its fundamental aim is laid down in a memorial pamphlet by the founder, Dr. Lingner, who said:

> The Deutsches Hygiene Museum is to be a place of instruction for all, where everyone may acquire instruction necessary for healthy life. The exhibits are to be arranged in such manner that laypeople may understand them with the help of simple explanations. The construction of those models is a highly scientific work and a specialty of the scientific department.

The focus of the Museum is the collection, Der Mensch, with a separate room for the so-called "Transparent Man." It is really a wonderful model, made of a kind of celluloid, and the inner organs such as the heart, lungs, brain, and so on are lighted up automatically one after the other. The twenty museum-halls housed in two different floors, cover nearly 6,000 sq. m., or 7,500 sq. yds. The collections of the Museum deal with biological-hygienic instruction, the anatomical and physiological foundations of physical exercise, the care of mother and child. There is a special division for eugenics and for the problem of right nourishment. Industrial hygiene and the protection of workers have their places. Quite modern is the room *Health and Sickness.* The problem of modern biological science, as constitution, disposition, and the influence of surroundings upon health are here demonstrated in a most instructive manner.

This is followed by the department of such infectious and contagious diseases as tuberculosis and venereal diseases. A special room deals with the problem of cancer. Two combined historical and ethnographical groups show the hygienic and non-hygienic life in classical times and in the middle ages, and also those things which are interesting as hygienic usages in the life of natives such as the negroes in Africa, the Indians, the Chinese people and so on. A special room is reserved for temporary exhibits, which are changed every month.

There are not only these exhibition rooms; there is also a school for expectant mothers, a cookery school especially for special diets; there are rooms for classes in first aid, and for evening classes; there is a gymnastic room, and also a library with a large collection of 3,000 illustrated posters from all parts of the world.

There is one unique characteristic of the work of the Deutsches Hygiene Museum. All the exhibits are made in our own special workshops, whether pictures, placards, lantern-slides, models, anatomical preparations (after Prof. Spalteholz') wax models. There are new models of celluloid, unbreakable,

not affected by heat or cold, much lighter than wax, and cheaper by one-third.

Another aspect of the Museum's work is of great interest for public health workers. After the war the Museum sent out several itinerant exhibitions. In 1919–1920 people were badly undernourished, and in consequence many died of tuberculosis. The Museum started a special exhibition to teach people how to avoid tuberculosis, and advised them to consult a doctor in good time. It was also necessary to have an exhibition enlightening people on venereal diseases. Since then there have been shown many traveling exhibitions in most towns and villages of the Reich. They are called: "Fight Cancer," "Right Nourishment," "Healthy Women—Healthy Nation," and so on.

There is also an automobile exhibit with a special tent, serving as an exhibition hall wherever the car stops. Dr. W. W. Peter calls this automobile the "Healthmobile." It travels through the rural districts of Germany, staying 2 to 3 days in each place to show the people of the district how to live healthily. Twenty million visitors have seen our exhibits in Germany. The traveling exhibits are also taken abroad. The Museum has shown its exhibits in many towns of Switzerland, Austria, Czechoslovakia, in Sweden, Norway, Hungary.

The appreciation which the Museum's work has met, is further proved by several requests to organize new museums or to lend certain important exhibits to different countries. Many such requests were granted as in the case of the museum at Klausenburg (Roumania). Also the Egyptian Government commissioned the Museum to organize a museum in Cairo. It is the same with the Yugoslavian Government: we organized two museums there at Belgrade, and one at Agram. The Hygiene-Section of the League of Nations requested the Museum to arrange material for medical education at Warsaw, Moscow, and Charkow. It may be known to you that there are many models of the Deutsches Hygiene Museum in the scientific halls of the Century of Progress Exposition in Chicago.

Nearly 700,000 lantern slides, 350,000 illustrated posters, and many thousand casts and models from the Museum are used throughout the world. The Lantern Slide Service alone has more than 100 series, and each has from 50 to 60 slides concerning all branches of public health. They are employed in schools and for special lectures. One can hire or buy them, and they can be used in any country no matter what its language.

These are some of the services which it has been the privilege of the Deutsches Hygiene Museum to perform in its homeland and abroad. The institution is a tangible evidence of the vision and faith of its founder in the efficacy of visual methods in health teaching. The fight against sickness and unhygienic conditions knows no territorial boundaries. In this work the Deutsches Hygiene Museum is glad to be associated with health educators in America and in other parts of the world.

Health Problems Connected with the Ethylene Treatment of Fruits*

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CONSUMERS are prone to judge the quality of fruits by the appearance. Nicely colored oranges, bananas or peaches which are attractive to the eye will sell better than an equal or even better quality of the same fruits not so well colored.

For ages therefore fruit shippers have endeavored to improve the color of their wares by polishing, waxing, wrapping in colored paper, holding in warm humid atmospheres and other devices. However, nature affords many examples where color is not correlated with quality or even maturity. For instance, the California Valencia orange is better colored in January or February before it is mature than it is at the height of its maturity in August, for as soon as hot weather sets in the stem and blossom ends of this fruit begin to turn green. If the consumer will pay more for well colored fruit the growers and shippers of that fruit will do their utmost to secure the premium paid for appearance. While undoubtedly the ethylene treatment is used for this very purpose, the events leading up to its discovery come wholly from another line of endeavor; namely, attempts to avoid freezing of the fruit during packing and shipping.

In the Tulare County, Calif., orange district in the early days of orange shipments kerosene stoves were used in the packing sheds, and in a few cases, in the cars in order to avoid danger of frost injury. One or two fires in transit, and the railroads put a stop to their use in cars. Shippers state that at first they had no other purpose than to keep the fruit warm, but eventually noticed that fruit heated in this way developed a better color than that packed without heating. Kerosene stoves were used solely for the reason that they were available and afforded the cheapest source of heat. Some enterprising but unfortunate individual built a heating plant using steam in place of the cumbersome kerosene stoves, and discovered to his dismay that he could get no better color in this way than if the fruit were not heated. Very soon the use of kerosene stoves became universal in citrus packing houses. Gas and the exhaust from automobiles and motorcycles were also used. In 1912 Sievers and True, Bureau of Plant Industry *Bulletin 232*, U. S. Department of Agriculture, proved that the combustion gases were responsible for the increase in color of fruit exposed to them.

Various methods were employed to apply these combustion gases, blue flame burners were placed in the coloring rooms surrounded by the oranges in

* Read before the Food and Nutrition Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 6, 1934.

boxes just as they had come from the field. The stoves were placed in basements under the coloring rooms, the gases ascending through the latticed floors, and finally the stoves were placed in cement houses outside the packing houses and the fumes circulated by means of fans and conduits to the coloring rooms. The latter method was an improvement over keeping the stoves in the rooms where with the best of attention the fruit was too often covered with soot from smoky burners. An idea prevailed at this time that the more evil smelling the atmosphere in the coloring rooms the quicker the coloring would take place. The atmospheres were often so acrid and tear compelling that the rooms had to be ventilated for some time before the workmen could enter without being subject to headache and other discomforts.

A later development was the installation in Tulare County of a set-up for making carbon monoxide, by injecting steam into incandescent coke. Not only was this a serious menace to the workmen but was a failure as a coloring agent. Up to this time the coloring of fruit was more or less haphazard. The results were never certain, the fire risk was high and the care of the stoves troublesome.

We began our investigations of the coloring problem in 1918 by ascertaining the constituents in the atmospheres of the coloring rooms. Owing to the variety of conditions encountered great difficulty was experienced in drawing conclusions from the data obtained. The coloring efficiency was not correlated with carbon dioxide or carbon monoxide, unsaturated hydrocarbons or with any other constituent or factor which we could recognize. Finally by separating the different groups of constituents from the combustion gases of the kerosene stoves it was discovered that the unsaturated compounds were those having the property of improving the color of the fruit. As ethylene and acetylene were the unsaturated compounds present in greatest quantity, they were given first trial. Apparently both gave satisfactory results but further investigation proved that purified acetylene was not effective. In all probability traces of ethylene in the acetylene had accelerated the coloring. Fortunately ethylene was being produced commercially, having been used during the war in the manufacture of poison gas. It was found that ethylene in dilutions as high as 1 part in 2,000,000 would noticeably accelerate the coloring of black green lemons. For commercial practice on citrus fruits, 1 part in 5,000 to 10,000 parts of air seemed to give most satisfactory results. That high dilutions of the gas were efficient was also fortunate for even at the maximum strength recommended, 1 part to 1,000, 30 times that amount would have to be used before an explosive mixture would be obtained. In 1923 Dr. F. E. Denny, who had been working in our laboratory on this investigation secured a public service patent covering the method.

Commercially the gas is dispended in cylinders containing from 25 to 30 lb. (about 300 cu. ft.) under pressures of 1800 lb. per sq. in. The method of operating is to place the fruit in packing boxes, stack the boxes in a reasonably gas-tight room in such a way that the circulation of air about them will not be hindered. The gas is then run into the room through a flow gauge or other measuring device until the proper proportion is reached. The rooms are thoroughly ventilated and recharged every 6 to 12 hours, depending on weather conditions. Where continuous ventilation is used the gas is permitted to " trickle " into the air current. During hot weather this system has the advantage of keeping the temperature in the treating rooms within a reasonable range.

Ordinarily citrus fruit will color in

from 2 to 5 days under this treatment and will soften sufficiently for satisfactory packing.

The treatment of other fruits is essentially the same. With pears and the Japanese persimmon 1 part of gas to 1,000 of air is used although 1 in 5,000 would probably work as well. In 4 to 6 days pears soften, become yellow and are in excellent shape for canning. With pears the chief object of the treatment is to save sorting. Left to themselves, pears would require from 10 days to 2 weeks to soften and would do so unevenly. This uneven maturity could be taken care of by sorting, but at extra expense and with some loss in the grade, for at each sorting a few of the pears are sure to be bruised.

In the case of persimmons, from 48 to 96 hours will do the trick, softening them, coloring them and removing the astringency better than if they are kept in storage until soft.

Our personal experience with tomatoes has not shown a profitable use for ethylene. It has been reported as used with satisfaction by some shippers and jobbers. We have also had reports on its successful application to bananas.

The latest development, one upon which we are now working, is the use of the gas for removing the hulls from walnuts. In order to secure the best quality the walnuts in some districts of California should be harvested as early as possible. If they are harvested early, however, there will be a considerable percentage of "sticktight" nuts—in other words those from which it is almost impossible to remove the hull. Treatment with ethylene causes the hulls to become friable so that they are readily removed by the various hulling devices.

The changes produced by ethylene are solely those which would have been brought about by nature in a somewhat longer time and less uniformly. Whether this hastening of the natural reactions is due to activation of the enzymes contained in the fruit or whether it is caused by a changed permeability of the tissue which allows the enzymes to come in contact with and change the natural constituents, is difficult of proof. We have never encountered a change which is not a natural one. The process is often called a coloring process, which in one sense is a misnomer. It does not add color but destroys chlorophyl by the usual processes of nature and leaves the natural color of the fruit in its place. This is illustrated by the changes in both citrus fruits and persimmons. No matter how long grapefruit or lemons are treated with ethylene they will not assume an orange color. When the chlorophyl is destroyed through the indirect action of the gas only the natural color of the fruit remains. Oranges which are harvested before maturity, when treated rarely develop a good orange color but are more of a lemon yellow than orange. Persimmons gathered too early will not yield a satisfactory color on processing, but will be dull reddish brown instead of red.

Contrary to popular belief, neither the sugar nor acid of citrus fruit is changed by the treatment. It has been a common practice in some packing houses to set aside or treat fruit that does not reach the maturity standard required by law, in the belief that in a few days it will gain in sugar or lose in acid enough to pass the test. Sometimes such changes are supposedly brought about by ethylene treatment or by storing. In such cases, however, irregular sampling is the cause of the apparent change. No matter how many adverse results have been secured the packer will base his conclusions on one favorable test, when a few more tests would show him the fruit as a whole had not changed.

In some fruits where nature has provided material from which sugars are

produced by natural processes, such changes will take place during the treatment. Bartlett pears and bananas contain starch which even after the fruit is picked will change into sugar. Ethylene will bring about this change in pears in 4 to 6 days, whereas if left to stand it would take from 10 days to 2 weeks to accomplish the same result. The treated pears will be uniform in color and texture, whereas the untreated will not.

In the case of the Japanese persimmon the changes in the tannin compounds are likewise much more uniform in the treated fruit. The astringency will entirely disappear during treatment with no traces left, as is common when the fruit matures naturally.

If our conclusions are correct and only the natural reactions take place on treatment, there is little to be said on the health problems connected with the process.

However, the question of the hazard to health may be considered from 2 points: (1) the dangers to the workers in the fruit packing plants or canneries; (2) the consumers' risk in eating the treated material. We have never noted the least inconvenience among our own or other workers from breathing the usual dilutions of the gas employed. It is well known that ethylene is an anesthetic and that ethylene-air mixtures are explosive. As an anesthetic it is mixed with oxygen in ratio of 4 parts of gas to 1 of oxygen. Explosive mixtures must contain from 3 to 25 per cent of ethylene in air, so that a mixture 30 times as strong as that recommended would have to be used before the danger point for explosion would be reached, and 800 times before there would be danger of anesthesia. The insurance and indemnity companies have gone into the matter thoroughly and permit the use of the process in insured buildings under certain restrictions.

Under the second heading it could be conceived that danger might come from impurities in the gas absorbed by the fruit and carried to the consumer in this way. Impurities common to ethylene amount to about 2 per cent, 75 per cent being ethane, a saturated hydrocarbon gas not so active chemically as ethylene. Traces of carbon dioxide, propane, acetylene, and acetone also occur. All are probably quite harmless in the dilutions in which they occur. Acetone and acetylene are present in the treating room atmosphere in the proportion of 1 part per 1,000,000. It would appear therefore that the hazard from this source is negligible. It is within the realm of possibility that the reactions caused by the gas within the fruit might form injurious compounds. We have not discovered any reactions caused by the treatment that would not take place naturally in a longer time.

Another phase of the question which must be considered is the possible effect of ethylene on the vitamin C potency of the juices made from fruit treated by the process. A thorough investigation of this question has been made by experts in the Department of Agriculture.* Tests were made on fruit picked at the same time from the same tree, part of which was allowed to stand at room temperature, and part treated with ethylene immediately after picking. The fruit was picked from all sides of the tree so as to obtain specimens of approximately the same size and maturity. The two lots were analyzed on the same day, being titrated with a suitable indicator to determine the reducing value of the juice and thus give an index of vitamin C content. The following results were obtained:

Control sample, immediately after picking 7.11 ± 098
Control sample, after holding at room temperature 7.19 ± 094
Treated sample $7.03 \pm .102$

These data indicate no significant

* Unpublished data, this Bureau.

difference between the reducing values of the juice from oranges treated with ethylene and from similar fruit not treated. The indications are, therefore, that the vitamin C content of the fruit is not affected by the ethylene treatment.

The concealment of inferiority by coloring is more a question of fraud than of health. With few exceptions fruit harvested before it is commercially mature will not color satisfactorily. We have had complaints from those interested in child feeding that the fully colored oranges they were getting were too sour and caused digestive disturbances in children. These complaints are usually received at the time when it is necessary to switch from the summer crop to the winter crop or *vice versa*. The crop which is closing is thoroughly matured fruit low in acid. The new crop naturally is higher in acid even if it is commercially mature. There is no way to avoid the change unless canned or frozen juice can be substituted for the fresh. This can be done now with the assurance that the full vitamin C content of the juice is preserved and that a satisfactory flavor will be found. Commercial maturity is defined by state laws in both Florida and California. The provisions are liberal and the fruit which will pass the standards is not satisfactory to everyone. On the other hand, not all fruit which becomes fully colored on the tree would be satisfactory to everyone.

In conclusion we feel that the ethylene process has deservedly found a place in the preparation of fruit for the market, that it is harmless, and that with proper state and federal regulation little if any fraud can be perpetrated through it.

Buy Christmas Seals

Help Fight Tuberculosis

"Little Red" Cottage

THE Christmas Seal this year commemorates the 50th anniversary of the beginning of modern sanatorium treatment in the United States by the late Dr. Edward Livingston Trudeau at Saranac Lake, New York, in February, 1885. The one room cottage the seal depicts became the nucleus of the sanatorium movement in this country. Today there are 659 sanatoria containing a total of 86,917 beds. The cottage, called the "Little Red" because of its color, is preserved at the institution founded by Dr. Trudeau, which today bears his name.

Pleo-Antigenicity of Proteus X19*

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IN a previous study Welch and Poole [1] reported the finding of a pleo-antigenic variant occurring spontaneously in a stock strain of Proteus X19. It was demonstrated that both the spontaneous variant and an artificially induced variant would agglutinate in antisera for members of the Shigella, Eberthella and Salmonella groups of organisms whereas the parent Proteus X19 strain was inagglutinable in such sera. Further study indicated the phenomenon was not due to acquisition of new antigenic components by these variants but that the parent Proteus X19 strain had in its makeup similar agglutinogens although not demonstrable by direct agglutination. The presence of these agglutinogens could be demonstrated, however, by the production of the corresponding heterologous agglutinins in sera of animals inoculated with the parent strain. In this connection, Mackenzie and Fitzgerald [2] have demonstrated that antigenic components not demonstrable in the original parent culture may appear in variants of organisms of the Salmonella and Shigella groups.

Because of the wide use of Proteus strains by diagnostic laboratories in the Weil-Felix reaction it seemed of practical importance to study in a similar manner strains † obtained from various sections of the United States and Canada in an attempt to determine whether other strains in use had similar characteristics to the one previously reported. Nineteen of these strains were being used diagnostically; 5 were labelled as variants when received. The morphology, biochemistry and serology of 22 strains from this country and 2 from Canada have been studied and are reported on in this paper.

MORPHOLOGY

Microscopic—Each strain was studied microscopically using direct smears from the original agar slant culture. There were marked variations in morphology. In many cultures Gram-positive staining organisms were present although Gram-negative short bacilli predominated. In 17 of the 24 cultures studied long filamentous forms were evident ranging from approximately 2 per cent to 90 per cent of the organisms in each microscopic field.

* Read before the Laboratory Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 3, 1934.

† Strains designated by names of states, provinces, National Institute of Health, and New York City are used diagnostically in the Weil-Felix reaction in these official laboratories. The 4 Storrs strains were obtained from the Department of Bacteriology of Connecticut State College. Three of these were known variants originally obtained from Dr. Philip Hadley. The HXK and OXK (Kingsbury) strains were obtained from the Harvard Medical School, Department of Bacteriology and Immunology, with the information that these had been received recently from Dr. A. Felix of the Lister Institute. The strain designated Norton was received from the Department of Bacteriology of the Upjohn Company of Kalamazoo, Mich. The authors express their appreciation to all who kindly furnished the cultures for this study.

TABLE I

BIOCHEMICAL REACTIONS OF 20 PROTEUS X STRAINS

	Massachusetts X19	Massachusetts X2	California X19	Ohio X19	Michigan X19	New Jersey (1) X19	New Jersey (2) X19	Connecticut 0X19	Storrs X19	Norton 50 X19	Alabama X19	National Institute X19	Storrs Rough Mucoid	New York State 211 X19	New York State 32276 X19	Wisconsin X19	Ontario X19	Quebec X19	HXK	OXK	Storrs Smooth	Storrs Mucoid	New York City X19	American Type Collection X19
Dextrose	AG	AG	AG	AG	AG	AG	A(G)	A(G)	AG	AG	AG	AG	AG	AG	AG	A	AG	AG	AG	AG	AG	A(G)	AG	A
Lactose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sucrose	AG	AG	AG	AG	AG	AG	AG	A(G)	AG	AG	AG	AG	AG	AG	AG	A(G)	AG	AG	AG	AG	AG	A(G)	AG	A
Salicin	AG	AG	AG	AG	AG	AG	AG	A(G)	AG	AG	AG	AG	A(G)	AG	AG	A(G)	AG	AG	0	0	0	0	AG	A
Maltose	AG	AG	AG	AG	AG	AG	AG	A(G)	AG	AG	AG	AG	A(G)	AG	AG	A(G)	AG	A(G)	0	0	AG	A(G)	AG	A
Mannite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabinose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A(G)	0	0	AG	0
Raffinose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AG	0
Cellobiose	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	A
Inosite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dulcite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xylose	AG	AG	AG	AG	A(G)	AG	AG	AG	AG	AG	AG	AG	AG	A(G)	AG	A(G)	AG	AG	AG	A(G)	AG	AG	AG	A
Sorbite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galactose	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	A
Adonite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycerol	0	0	0	0	0	0	0	0	0	0	0	0	0	A	A	A	A	A	A	A	A	A	A	A
Dextrin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A	A	0	0	0	0	0	0	0	0
Citrate	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr	gr
Voges Proskauer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methyl Red	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Nitrate	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Indol	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+
Gelatin	liq	liq	liq	liq	liq	liq	liq	liq	0	0	liq	liq	liq	0	liq	liq	liq	liq	0	0	0	liq	liq	liq
Litmus Milk	N	A-N	A-N	N	N	A-N	A-N	A-N	A-N	A-N	A-N	A-N	pept.	N	A-N	N	A-N	N	N	N	pept.	pept.	A-N	N
Krumwiede s	AGB	AGB	AGB	A(G)B	AGB	A(G)B	A(G)B	AGB	AGB	AGB	A(G)B	AB	AGB	A(G)B	AGB	A(G)B	AGB	A(G)B	AGB	A(G)B	A(G)B	AB	AGB	A(G)B
Triple Sugar	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	Alk.S	Alk.S	AS	AS	AS	AS
Motility	+	+	+	+	+	0	0	0	+	+	0	0	+	+	+	+	+	+	+	0	+	+	+	+

A = Acid AG = Acid and Gas + = Positive liq = liquefaction A(G) = Acid with slight gas 0 = Negative result N = Neutral
gr = growth pept. = peptonization B = butt S = slant

This was particularly true of the National Institute of Health Strain 504 which on receipt showed a majority of interwoven filamentous forms with only a few shorter rods. In most cases where filamentous forms were observed definite Gram-positive granules could be distinguished. Although cultures varied in morphology from short, fat rods to long, narrow, filamentous forms, there was nothing sufficiently clear-cut to separate these strains into groups on a morphological basis.

Macroscopic—The colonial study of all strains was made on eosin-methylene-blue agar for a 72 hour growth period at 37° C. On this medium 15 strains developed a definite metallic sheen similar to that produced by *Escherichia coli*, some strains producing this sheen within 24 hours. Of the 9 strains showing no metallic sheen, 4 were known variants. In most instances at least 2 distinct types of colonies developed, ranging from 1 to 5 mm. in diameter—one usually clear, colorless, raised, glistening, entire and convex; the other opaque, blue to black in color, raised and convex with erose edges. Between these extremes were several gradations in color, size, and morphology.

In an attempt to determine whether there existed in these 24 strains under study variants similar to the one previously reported,[1] more than 150 colonies were fished from eosin-methylene-blue agar plates, and further studies made of the biochemical and morphological characteristics of the resulting strains. In no instance were we able to isolate in this manner directly from the cultures, variants of the type mentioned above.

In broth (pH 7.2) all cultures grew moderately well showing an even turbidity with small amounts of flocculent precipitate in the bottom of each tube in most instances. Hanging-drop preparations were made on 3, 8, and 24 hour broth cultures and, although it has been demonstrated[3] that the 'O' antigenic component is the reacting factor in the Weil-Felix reaction, 17 of the 24 strains studied were found to be motile. The results of the motility studies are given in Table I.

In studying the histories of the 24 strains interesting information was obtained regarding the condition of the cultures from a motility standpoint. On the basis of the source from which the cultures were originally obtained the 24 strains could be divided into 4 groups. In the first group were 3 strains: New York 211, Ontario, and Quebec, all of which, the histories indicate, were originally obtained from Dr. H. Mooser of Mexico City who designated these cultures as "O1." At the present time only one culture (Ontario) is non-motile. In the second group there were 12 strains all of which, according to the accompanying histories, were obtained at various times (1919–1932) from the National Institute of Health. Five of these were non-motile; National Institute 504, Connecticut, New Jersey (2 cultures—both National Institute 18), and Alabama. (In the history obtained with this last strain it was noted that some difficulty had been encountered with this culture and it had been found necessary to fish non-motile colonies after plating it out.) The American Type Collection, Massachusetts X2, Massachusetts X19, Norton 50, California, Ohio, and New York 32,276 strains were all motile. In the history of the latter it was noted "strain 32,276 was received from the National Type Collection in 1932 and was listed in their 1931 catalogue as 3,138-O derived by Weil and Felix from their 3,137-H." In the third group were placed 4 strains for which no history was obtainable, all of which were motile. These were Wisconsin, New York City, Storrs X19, and Michigan. In the fourth group were placed the 5 known variants; 4 of these were motile

TABLE II

AGGLUTINATION OF PROTEUS X STRAINS WITH 12 PREPARED PROTEUS X19 SERA

Organisms	Sera											
	Connecticut X19	New Jersey 1	Michigan	Massachusetts X19	Quebec	Wisconsin	California	Ohio	Alabama	National Institute 504	New York 211	Ontario
Connecticut	*2,560**	5,120	2,560	2,560	2,560	1,280	2,560	5,120	5,120	5,120	2,560	2,560
New Jersey (1)	2,560	*5,120**	2,560	5,120	5,120	1,280	5,120	2,560	2,560	5,120	2,560	2,560
Michigan	1,280	5,120	*5,120**	5,120	10,240	640	5,120	5,120	5,120	10,240	5,120	2,560
Massachusetts X19	5,120	10,240	10,240	*5,120**	10,240	2,560	10,240	10,240	10,240	5,120	10,240	10,240
Quebec	5,120	10,240	10,240	10,240	*10,240**	2,560	5,120	10,240	5,120	10,240	5,120	5,120
Wisconsin	2,560	5,120	2,560	2,560	2,560	*1,280**	5,120	2,560	2,560	2,560	2,560	5,120
California	1,280	5,120	2,560	5,120	2,560	1,280	*2,560**	5,120	2,560	5,120	5,120	2,560
Ohio	1,280	5,120	2,560	5,120	2,560	1,280	5,120	*5,120**	2,560	5,120	2,560	2,560
Alabama	5,120	10,240	10,240	10,240	5,120	2,560	10,240	10,240	*10,240**	10,240	5,120	10,240
National Institute of Health 504	10,240	20,480	10,240	5,120	10,240	2,560	5,120	5,120	10,240	*10,240**	10,240	10,240
New York State 211	2,560	10,240	10,240	5,120	10,240	1,280	5,120	20,480	5,120	5,120	*5,120**	5,120
Ontario	1,280	5,120	10,240	5,120	5,120	1,280	5,120	5,120	10,240	5,120	5,120	*5,120**
Storrs X19	2,560	10,240	10,240	2,560	10,240	2,560	2,560	5,120	5,120	5,120	5,120	2,560
American Type Collection	1,280	10,240	5,120	5,120	2,560	1,280	2,560	2,560	2,560	5,120	2,560	2,560
New York State 32276	2,560	5,120	10,240	5,120	5,120	1,280	5,120	5,120	2,560	5,120	5,120	2,560
New Jersey (2)	1,280	5,120	5,120	5,120	2,560	1,280	2,560	5,120	5,120	5,120	5,120	2,560
New York City	1,280	2,560	5,120	2,560	5,120	2,560	5,120	5,120	5,120	2,560	2,560	2,560
Massachusetts X2	5,120	10,240	10,240	10,240	10,240	2,560	5,120	10,240	10,240	20,480	5,120	10,240
Norton 50	2,560	5,120	5,120	10,240	2,560	1,280	20,480	10,240	5,120	20,480	5,120	10,240
Storrs Rough Mucoid	0	0	0	20	20	0	40	0	0	0	40	0
Storrs Mucoid	160	20	40	0	40	0	80	80	640	40	0	0
Storrs Smooth	0	0	640	80	40	0	40	0	80	40	80	0
OXK	0	0	0	0	0	0	0	0	0	0	0	0
HXK	0	0	640	20	20	0	20	0	0	0	160	0

* Homologous titers.

(HXK–(Kingsbury), Storrs Rough Mucoid, Storrs Mucoid, and Storrs Smooth), and 1 strain was non-motile, OXK–(Kingsbury) strain.

This portion of the investigation indicates definitely that Proteus strains to be used diagnostically in the Weil-Felix reaction must be checked for motility at reasonable intervals if such cultures are to be maintained in the proper and most efficient state. In connection with this our investigation would indicate that diagnostic Proteus strains should be carried in stock cultures on media from which the water of condensation has been removed by dehydration since the presence of this water apparently increases the possibility of the development of motile variants from what was originally a non-motile strain.

On Krumwiede's triple sugar medium an acid and gas butt and an acid slant were produced by 20 of the 24 strains. Two strains showed an acid butt without gas and an acid slant, both of which produced gas in small quantities in carbohydrate media. The other 2 strains produced acid and gas butts and alkaline slants.

BIOCHEMICAL REACTIONS

All 24 strains after being tested for purity were inoculated into carbohydrate media (sterilized by filtration) and examined each day for 18 days. The biochemical reactions are given in Table I. In general, except for the known variants, acid and gas were produced in dextrose, sucrose, salicin, maltose, cellobiose, xylose and galactose. Lactose, mannitol, rhamnose, arabinose, raffinose, inositol, dulcitol, sorbitol, adonitol and dextrin were not fermented by most strains. However, 8 cultures produced acid in glycerol. The HXK and OXK strains failed to ferment salicin and maltose. The Storrs Smooth and Storrs Mucoid strains failed to ferment salicin, but did ferment maltose (one of these, Storrs Smooth, produced acid and gas in arabinose). The New York City * strain, which according to its history had been carried in stock 22 years, showed the greatest amount of variation from the typical Proteus fermentation, producing acid and gas in lactose, arabinose, and raffinose. The carbohydrate reactions of this particular strain are similar to the reactions of certain strains of *Escherichia coli;* however, in the serological studies of this strain definite agglutination in high titers were obtained with Proteus X sera. Apparently long cultivation on artificial media had brought about these variations from the original type. The American Type Collection strain did not produce gas in carbohydrate media. Most strains were able to grow in Koser's citrate medium. The Voges-Proskauer test was negative with all 24 strains, which gave positive methyl-red tests and reduced nitrates. Six strains failed to produce indol and 16 liquefied gelatin. The reactions in litmus milk ranged from acid to neutral, and 3 cultures, all variants, showed peptonization.

SEROLOGICAL STUDIES

In order to test the serological relationship of the strains under study, 12 rabbits (free from natural agglutinins) were injected every day over a period of 12 days with increasing doses of live organisms. The 12 strains chosen for preparation of sera were: Connecticut, New Jersey 1, Michigan, Massachusetts, Quebec, Wisconsin, California, Ohio, Alabama, National Institute 504, New York 211, and Ontario. The homologous titers of these sera varied between dilutions of 1:2,560 to 1:10,240 with the exception of the Wisconsin serum which developed a titer of only 1:1,280.

* A duplicate of this culture was obtained from the New York City Laboratories 3 months after this work was completed. Identical results were obtained.

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The results obtained when testing the 24 strains against these prepared sera are given in Table II. In these sera in most instances the Proteus strains, except for the known variants, gave agglutinations which approached very closely the homologous titers. On the other hand, the variants agglutinated only slightly or not at all.

Agglutination of Known Variants in Heterologous Sera—Since in our previous study it was demonstrated that variants of Proteus X19 strains would agglutinate in heterologous sera, all the known variants used in this study were tested against *Eberthella typhi* (Michigan), *Eberthella typhi* 'O' (New York), *Shigella paradysenteriae* Army, *Salmonella schottmuelleri* and *Salmonella enteritidis*. The OXK and HXK strains showed practically no agglutination with the above heterologous sera. Only slight agglutination was obtained with the Storrs Smooth and Storrs Mucoid organisms, whereas the Storrs Rough Mucoid organism showed definite agglutination in all 5 heterologous sera, the titers varying from 1:80 to 1:320.

Agglutination of Heterologous Organisms in Known Proteus Sera—All 12 of the Proteus sera prepared were tested for heterologous agglutinins using the following organisms: *E. typhi* (Michigan), *E. typhi* 'O' (New York), *Shigella paradysenteriae* Army, *Salmonella schottmuelleri*, and *Salmonella enteritidis*. Five of these Proteus sera (Michigan, Ohio, National Institute 504, Connecticut, New Jersey 1) showed agglutinins for all the above heterologous organisms, ranging in titers from

TABLE III

ABSORPTION OF ELEVEN PROTEUS X19 SERA WITH HETEROLOGOUS ORGANISMS

Proteus Sera	Organisms	Average Titers
Unabsorbed: Michigan—Ohio—National Institute 504 Connecticut—New Jersey (1)	*E. typhi* Michigan	160—640
	E. typhi 'O' New York	160—320
	Salmonella schottmuelleri	80—160
	Salmonella enteritidis	80—640
	Shigella paradysenteriae Army	80—160
Absorbed: Michigan—Ohio—National Institute 504 Connecticut—New Jersey (1), each: *with* *E. typhi* (Mich.) *E. typhi* 'O' (N.Y.) *Sal. schottmuelleri*, *Sal. enteritidis* & *Shigella paradysenteriae* Army respectively:	*E. typhi* Michigan	0
	E. typhi 'O' New York	
	Salmonella schottmuelleri	
	Salmonella enteritidis	
	Shigella paradysenteriae Army	
	Homologous sera strains	2560—10240
Unabsorbed: Quebec—Ontario—New York 211—California—Alabama and Massachusetts (X19)	*E. typhi* (Mich.)	0
	E. typhi 'O'	
	Salmonella schottmuelleri	
	Salmonella enteritidis	
	Shigella paradysenteriae Army	80—160
Absorbed: Quebec—Ontario—New York 211—California—Alabama and Massachusetts X19 each *with* *Shigella paradysenteriae* Army	*Shigella paradysenteriae* Army	0
	Homologous sera strains	2560—10240

NOTE: The absorption of each of the above 11 Proteus sera with homologous organisms removed completely both homologous and heterologous agglutinins. The 12th sera (Wisconsin) prepared showed no heterologous agglutinins.

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1:80 to 1:640; 6 Proteus sera (Quebec, Ontario, New York 211, California, Alabama, and Massachusetts) showed agglutination only with *Shigella paradysenteriae* Army with titers ranging from 1:80 to 1:160; 1 strain (Wisconsin) did not develop demonstrable agglutinins for any of the above heterologous organisms. These results are included with the agglutinin absorption tests in Table III.

On the basis of these results the 12 Proteus strains were divided into 3 groups. In Group I were placed the Michigan, Ohio, National Institute 504, Connecticut, and New Jersey strains, each capable of developing agglutinins for 5 heterologous organisms; in Group II were placed the Quebec, Ontario, New York 211, California, Alabama, and Massachusetts X19 strains, each developing agglutinins for *Shigella paradysenteriae* Army only; in Group III was placed the Wisconsin strain which did not develop agglutinins for any of the 5 heterologous organisms with which it was tested.

Agglutinin Absorption—Our previous study of heterologous agglutinins in a Proteus X19 serum had shown that these agglutinins were bacterial group agglutinins and not due to the presence of heterophile components also present. In order to obtain further information regarding the source of the heterologous agglutinins in 11 of the 12 Proteus sera prepared for this study, each serum of the Proteus strains in Group I was absorbed with each of the 5 heterologous organisms for which agglutinins had been demonstrated. Each Proteus serum in Group III was absorbed with 1 heterologous strain, *Shigella paradysenteriae* Army. Each serum after absorption was titrated for heterologous and homologous agglutinins.

Agglutinin Absorption Method—The agglutinating serum was diluted to a degree depending on the titer of heterologous agglutinins. These dilutions varied from 1:10 to 1:20. Six ml. of the diluted serum was added to a 24 hour agar slant of the organism under study. With a platinum needle, the suspension was carefully emulsified in the serum. A small pledget of sterile absorbent cotton was dropped into the test tube and the suspension drawn up into a pipette. The cotton acted as a filter for gross particles. The suspension was pipetted directly to a sterile centrifuge tube, incubated in a water bath at 37° C. for 2 hours, and then centrifuged at high speed for 1 hour or until supernatant fluid was clear. The supernatant fluid was then pipetted under sterile conditions onto a second 24 hour slant culture and the procedure repeated. The procedure was then repeated on a third slant. (This third suspension may be placed in the ice box over night with equally good results.) Absorption with homologous organisms using this technic is usually complete.

The results of the absorption of 11 Proteus sera with heterologous organisms are given in Table III. It will be noted that in general the titers of unabsorbed Proteus sera with heterologous organisms ranged between dilutions of 1:80 and 1:640. The absorption of these sera with heterologous organisms removed not only the agglutinins of the absorbing strain but also all other heterologous agglutinins known to be present. These results indicated that we were dealing with group agglutinins. Since no heterologous agglutinins were demonstrated in the Wisconsin serum no absorptions with heterologous organisms were made.

In an attempt to determine whether the 12 Proteus strains for which no sera were prepared had heterologous antigenic components, representative sera of Groups I and II (above) were absorbed with each of these strains. The absorbed sera were then titrated for heterologous agglutinins. Consid-

erable difficulty was encountered in effecting complete absorption for the absorbing strain in several instances. This was particularly true of the representative sera chosen from Group I. However, heterologous agglutinins were removed with comparative ease from Group II sera which contained the *Shigella paradysenteriae* Army agglutinins only.

The OXK and HXK strains did not remove heterologous agglutinins from the sera of either Group I or Group II indicating that these 2 strains do not contain antigenic components similar to those in the heterologous organisms studied. On the other hand, satisfactory controls of these absorptions were not possible due to lack of agglutination of these 2 organisms in the sera employed.

The Storrs Rough Mucoid, Storrs Mucoid, and Storrs Smooth strains absorbed heterologous agglutinins from a representative serum of Group I, indicating these organisms contain antigenic components in common with all the heterologous organisms studied. Two of these, the Rough Mucoid and Mucoid variants, also absorbed heterologous agglutinins from Group II serum. The Storrs Smooth strain, however, failed to do so but its titer in the serum was so low that no satisfactory control was possible and this result was, therefore, inconclusive.

The Storrs X19, American Type Collection, New York State 32,276, New Jersey 2, New York City, Massachusetts X2, and Norton 50, strains did not absorb heterologous agglutinins consistently from Sera of Group I but did absorb heterologous agglutinins from sera representative of Group II in all instances. This suggests that these strains do not contain heterologous agglutinogens similar to those present in the sera Group I but do have the *Shigella paradysenteriae* Army component corresponding to that in Group II. Since no sera were prepared for these 7 strains, we do not feel that the results are consistent enough to warrant definite classification of these particular strains into groups. Although there is some evidence from this portion of the investigation that the group agglutinogens present in Group I differ from the *Shigella paradysenteriae* Army agglutinogen in Group II, it was found that the absorption of Group I sera with strains representative of Group II, and *vice versa*, removed in the former absorption all heterologous agglutinins and in the latter, as would be expected, the component for the Army strain. In view of these results, it would appear that the organisms in Group II not only contain the Army antigenic component but also components (although masked) for the other heterologous organisms evident in Group I since the absorption of a Group I serum with a Group II strain removed completely the heterologous agglutinins present in this serum.

AGGLUTINATION WITH SERA FROM CLINICAL CASES OF ROCKY MOUNTAIN SPOTTED FEVER

In order to determine the efficiency of these strains in the Weil-Felix reaction —sera * from known clinical cases were titrated against all 24 Proteus strains used in this investigation as well as a variant described in a previous paper (*loc. cit.*). With the 19 diagnostic strains the titers were roughly comparable and in no case did we find any marked differences. The variant strains, however, with the exception of Storrs

* We are indebted to R. R. Parker, Ph.D., Special Expert of the U. S. Public Health Service, Rocky Mountain Spotted Fever Laboratory, Hamilton, Mont., for these sera. Since completion of these results several typhus sera have been received from H. Mooser, M.D., Pathologist, American Hospital Laboratory, Mexico City, Mexico, and from S. W. Bohls, M.D., Bureau of Laboratories, Texas State Department of Health, Austin, Tex. The results obtained with these sera were comparable with those obtained with the sera received from Dr. Parker. The authors express their appreciation to all who furnished sera for this study.

Rough Mucoid showed no agglutination in dilutions greater than 1:80. The Storrs Rough Macoid strain showed titers of 1:160 to 1:320, which were comparable in many instances with titers obtained with normal diagnostic strains.

DISCUSSION

The finding of pleo-antigenic variants of a Proteus X19 strain was reported previously. At that time the importance of the phenomenon to public health workers induced us to continue this investigation in a study of diagnostic strains from the United States and Canada in an attempt to determine whether other strains either had present in them dissociates or the inherent capacity for producing them as evidenced by the presence of heterologous agglutinogens which can be demonstrated only by animal injection (Welch & Poole [1]). In this study two major problems presented themselves: (1) To study the morphology of the cultures to determine the possible occurrence of variants and to identify them definitely as such; (2) to determine whether there were present in the sera from these strains components for heterologous organisms.

It was found that the 19 diagnostic strains on receipt in these laboratories did not contain variants comparable to the one previously described. Some morphological and biochemical differences were noted but these could not be correlated with differences in serological behavior. It was found, however, that only 6 of the 19 diagnostic strains were non-motile in spite of the fact that in several instances the motile strains had been obtained from originally non-motile cultures. For example, the Ontario, Quebec and New York 211 strains were all originally obtained from a single source. In this investigation the Ontario strain was the only one of these 3 retaining its original non-motile characteristics. This in itself is indicative of the necessity of making frequent checks on Proteus X cultures used for diagnostic purposes which should be preserved in a non-motile state. An alternative to this is the use of an alcoholized suspension prepared according to the method of Bien and Sonntag.[4]

Since sera for only 12 strains were prepared, definite proof of the presence of heterologous agglutinogens could be obtained only for these strains and the antigenic make-up of the remaining strains could only be inferred from cross-absorption studies. Our results indicated that heterologous agglutinogens were present in 11 of the strains for which sera were prepared. Although it was possible from an interpretation of these results to divide these organisms into 3 groups depending upon the number of heterologous components present, we do not feel that our inability to demonstrate certain antigenic components by direct agglutination in sera of organisms of Group II obviates their presence, especially since absorption of Group I sera with Group II organisms removed all heterologous agglutinins from the Group I sera. Apparently antigenic components in common with the Eberthella and Salmonella groups are present in the Group II strains in addition to 1 of the Shigella group but these are more effectively masked or more firmly fixed than in Group I. We found no evidence for the presence of heterologous components in the 1 strain in Group III. The major points brought out by the serological studies are: (1) that in general the Proteus X strains studied contain heterologous agglutinogens which may not be demonstrable by direct agglutination, and (2) that the variants studied are not agglutinable to any degree in sera from clinical cases and, furthermore, may contain free heterologous agglutinogens which may cause confusing, nonspecific reactions if present in diagnostic cultures. Our re-

sults with the 19 diagnostic strains used as antigen for the Weil-Felix reaction in sera from known clinical cases indicated their suitability for this purpose. On the other hand the variants with the exception of Storrs Rough Mucoid showed very slight or no agglutination with these sera.

The presence in the Proteus strains studied of heterologous agglutinogens which are demonstrable on injection into animals, coupled with the fact that dissociation of the organism may free these agglutinogens (previously demonstrated) so that they may be demonstrated by direct agglutination, indicates the necessity of a periodic morphological and serological examination of these strains. The use of such examinations will eliminate inagglutinable, spontaneous dissociates from the cultures, insure the retention of the strains in a non-motile state and disclose the presence of any free heterologous agglutinogens.

SUMMARY AND CONCLUSIONS

1. The morphological and biochemical characteristics of 19 diagnostic Proteus X strains and 5 variants are reported in detail. Marked differences in these characteristics were not noted except for the finding of 13 motile strains in the diagnostic group.

2. Heterologous antigenic components in common with the Shigella, Eberthella and Salmonella groups were shown in 11 Proteus X strains. Although these were not demonstrable by direct agglutination in heterologous sera, they were demonstrated in the antisera produced by them on injection into rabbits or failing this, by their ability to absorb heterologous agglutinins from other Proteus sera containing them. Only 1 of the strains for which sera were prepared showed the entire absence of heterologous components.

3. The heterologous agglutinins present in Proteux X sera were shown to be bacterial group agglutinins.

4. Known variants of Proteux X strains were shown to be practically inagglutinable in sera from clinical cases of Rocky Mountain Spotted fever and, in addition, certain of these variants would agglutinate directly in heterologous sera.

5. On the basis of these findings it is recommended that Proteus X strains used in the Weil-Felix reaction be checked at least once a month to insure working with a non-motile culture and at least once each quarter to exclude spontaneously occurring variants.

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EDITORIAL SECTION

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POLIOMYELITIS IN CALIFORNIA

WE have already said that the symposium on poliomyelitis was perhaps the most interesting single feature of our recent meeting in California. While we intend to give our readers the benefit of these papers which go into the details of the various questions involved, on account of the wide interest in the epidemic, it seems that we should at once give a bird's-eye view, so to speak, of the situation.

At once it may be said that the peak of the epidemic occurred in June, and since then, there has been a steady and marked decline, though cases have continued to appear, chiefly in Los Angeles City and County. Many more cases than usual have been seen in other parts of the state, especially Fresno County, and apparently there has also been some spread to the states contiguous to California. San Francisco, usually regarded as the largest city in the state (though the editor was recently called to order by some southern Californians on account of this statement) has been very free, and for some time past has run from 1 to 3 cases per week, the report for the week ending September 15, 1934, showing no cases.

There are several features of this epidemic which are unusual. Beginning in May, it was earlier than most poliomyelitis outbreaks. There has also been a decided shift in the age period of those affected. Five epidemics have occurred in California, beginning with 1912. That year 78 per cent of the cases occurred in children under 8 years of age, while for 1934 to date, only 44 per cent have been under 10 years of age, and the number of adults affected has been comparatively large.

The mildness of the disease has been characteristic. In San Francisco, with a small number of cases, the death rate has been 6.8 per cent; in Fresno County, which continues to have the largest number of cases next to Los Angeles County, the death rate has been 2.3 per cent, while in Los Angeles County, it is only 1.5

per cent. As of the 6th of September of the year 1934, there have been 2,732 cases.

An outstanding feature of this epidemic has been the high infectivity, as shown by the high percentage of households which had multiple cases, 22 per cent of all cases having occurred in such households.

The high infectivity of this outbreak is also shown by the great number of doctors, nurses, other attendants and workers about the hospital who have become infected. In Los Angeles, where 95 per cent of the cases were hospitalized in the General Hospital, 137 such infections have taken place, the greatest number having been among the doctors (15), nurses (58), and student nurses (39).

Apart from the epidemic in general, great interest attaches to the methods of prevention and treatment. In the General Hospital, 121,000 c.c. of serum, approximately 55,000 of which was from convalescents, were used. Blood was also taken from normal adults over 30 years of age. Whether from convalescents or from normal persons, the serum from 10–20 individuals was pooled. It was preserved chiefly by a 1:10,000 solution of merthiolate, and was always kept 5 days before use. Both aerobic and anaerobic cultures were made from each lot. There was no control as far as treatment went, since the authorities did not feel that it was justifiable to withhold serum from any patient. As far as its prophylactic use, there was some control, owing to the refusal by a certain number of persons to accept it. There is some difference of opinion as to its effect. Some feel that the symptoms were milder in those who received serum, and instances of relapses are given, 3 in one case, in which each time there was a marked and rapid amelioration of symptoms after the administration of serum. There were fewer cases of muscular involvement and paralysis among those who received serum, though the number of cases is too small to admit of positive conclusions. The one point which seems to stand out clearly is that there was no difference in value between adult serum and convalescent serum. There were no marked ill effects, though there were some cases of more or less severe serum sickness, and in some, acute pain at the time of infection, especially in those in whom the administration was intramuscular. So far as figures go, the prophylactic use of serum was not successful. Employees who received serum showed a slightly higher degree of infection than those who did not, and this was true also of those working in the Contagious Disease Unit.

It should be clearly recognized that all reports so far must be regarded as preliminary. We have the spectacle of a community provided with well manned hospitals, amply sufficient for ordinary and even peak loads, being very rapidly overwhelmed by an epidemic of unusual proportions. The illnesses among doctors and nurses cut down the personnel and forced the employment of medical and advanced students in some types of work.

Needless to say, all sorts of conditions have been incriminated, such as swimming pools, bathing beaches, milk and water supplies, etc. If one thing stands out more clearly than another according to present information, it is that personal contact is responsible for the spread. Of those working in the Contagious Disease Unit, 14 per cent were infected as against 4.5 per cent for other parts of the hospital.

The papers from the Symposium will appear in an early issue of the Journal

PREVENTION OF FLY BREEDING

WITH SOME NOTES REGARDING INSECT-BORNE DISEASES

IN 1931 the League of Nations Health Organization requested schools of hygiene to study flies and the best methods of treating manure heaps to prevent their propagation.[1] The Nancy Institute of Hygiene felt that this was especially deserving of its attention because of the fact that many parts of France were unfavorably known from the hygienic standpoint for the heaps of stable manure, often containing also the excreta of both normal and sick human beings, which stand before the houses along the streets in the villages. During the World War improvement was forced by the military authorities, but the farmers have returned to this ancient custom which dates back to immemorial times, and seems to be due in part to the actual structure of the old villages and the topography of the country.

The report contains much that is of interest. Experimental work has shown that individual flies without distinction of origin may carry from 60,000 to 25,863,000 germs, and in the case of flies captured near manure heaps, an even greater number. A large proportion of these organisms are colon, indicating the fecal source of the pollution. The report gives in some detail the methods by which these numbers were determined. Other experiments showed that milk (500 c.c.), when a single fly is placed on the surface, and left in contact with it for 30 minutes, then kept for 24 hours, will contain as many as 10,220,000,000 germs per c.c.

The authors have studied the effect of exposure to the sun as a method of sterilization of flies. When individuals taken from town flats and which showed 2,540,000 colonies at the time of capture were exposed for 2 hours to the sun, the number fell to 160,000. In flies taken near manure heaps and which showed at the time of capture 32,560,000 germs, only 6,720,000 remained after similar exposure to the sun, showing the destructon of 25,840,000 bacteria. From these experiments they hold that the bactericidal action of the rays of the sun is extremely powerful. Needless to say, it varies with the season, and the authors point out that their experiments are valid only for the months of July and August, when the light was most intense.

The report closes with a consideration of some methods of preventing breeding of flies in manure. In treating manure the agricultural value must not be destroyed, as it is one of our most valuable fertilizers. The authors favor the so-called Roubaud's biothermic method, and show that a temperature of 60° C. can be obtained in manure heaps by fermentation. They describe also a method in which by watering once or twice a day, a still higher temperature is reached, a desirable feature, since larvae, probably under the influence of the heat of fermentation, tend to come to the surface. They advocate the construction of 3 water-tight chambers with a ventilation shaft protected with wire gauze, a trap door for filling and a door for emptying, a sloping floor with channel to convey the liquid content to a cemented tank. Such an arrangement, which they describe in some detail and illustrate, does not destroy the fertilizing value of the manure and appears to accomplish the desired result.

As far as one can judge from the report, the authors are happily oblivious of the enormous number of studies carried out by Americans, of which we can mention only a few. As far back as 1897, L. O. Howard, Chief of the U. S. Bureau of Entomology, began to work on the subject. In July, 1914,[2] there was

published a bulletin on the subject, the result of consultations with other members of the department, and a large amount of careful work. The prevention of fly breeding in manure was the chief point of attack, and the preservation of the fertilizing value of manure was kept in mind. For this purpose treatment with borax 0.62 lb., or 0.75 calcined colemanite to 10 cu. ft. (about 8 bushels) was recommended. In May, 1915, an excellent bulletin was published by William B. Herms.[3]

As far as the carrying of disease by the house fly goes, Americans should remember the report of the commission composed of Victor C. Vaughan, E. O. Shakespeare, and Walter Reed, Vaughan alone surviving long enough to make the report. This was a study of typhoid fever during the Spanish-American War in 1898. It was clearly shown that in the camp at Chickamauga Park the food was contaminated by flies which had fed on fecal matter in the latrines and traveled from there to the tents. Many studies since have shown that the fly is capable of carrying many other diseases, and does so in some cases, particularly those of the intestinal tract.

The work of the Merchants' Association of New York deserves particular attention, 2 notable volumes having been published, the first [4] in 1907, and the second [5] in 1909. The first of these is a report of a careful experimental study by an expert. The second is a collection of opinions and facts obtained from a large number of health officers. Both, however, show that nearly 30 years ago even a body of laymen in this country had appreciated the danger of the fly to public health, and taken preventive measures against it.

America has been keenly alive for many years to the danger not only of the fly, but of insect carriers of disease. We can go back to 1848, when Dr. Josiah C. Nott incriminated the mosquito as a carrier of yellow fever. Dr. Carlos Finlay (1881) believed that he had proved the agency of the mosquito now known as the *Aëdes egypti* as a vector. This was finally proved by the U. S. Army Commission headed by Walter Reed, who made its first report in 1900. The first positive proof in the world that we know of concerning the agency of insects in carrying disease was given in 1893 by Theobald Smith, of the U. S. Bureau of Agriculture, when he showed that a tick carried Texas fever to cattle. McCoy, and other officers of our Public Health Service, made extensive studies of bubonic plague, and added much to our knowledge of its mode of spread, though to Ogata, 1897, belongs the credit of first showing the agency of the flea in transmission. In studying plague in rodents in California, McCoy (1911) discovered the disease now known as tularemia. In 1919, Francis showed that the so-called deerfly fever was due to *B. tularense,* harbored in jack rabbits and conveyed to man by the bite of the fly, *Chrysops discalis.* Rocky Mountain spotted fever, transmitted by the *Dermacentor andersoni* and *D. modestus* has also been worked out chiefly by Americans, and of late years chiefly by members of our Public Health Service, which now maintains a special laboratory for the purpose. The names of Wilson and Chowning (1902), King (1906), Ricketts (1906), Parker and Spencer (1923) are inseparably associated with our knowledge of this fatal disease.

Craig, in 1907, held that dengue was due to a filtrable virus and conveyed to man by a mosquito. A U. S. Army Commission, Siler, Hall, and Hitchens, gave final proof that the intermediate host is the *Aëdes egypti.* We also owe much of our knowledge of typhus fever to American workers. Ricketts and Wilder, Goldberger and Anderson, Maxcy, and the American Red Cross Commission, 1922,

deserve mention. Wilder, in 1911, produced strong evidence that the body louse was the exclusive infecting agent.

An American Commission also did good work on trench fever during the World War (1917), though credit for having discovered the cause of the disease must be given to McKee, Renshaw and Brunt, of England (1916).

In bringing up these matters, we do not mean in any way to belittle the excellent report to the League of Nations which has led to this discussion, nor the splendid researches done by scientists of other countries, but we are convinced that our people are entirely too prone to forget work done on this continent and to praise that done by foreigners. Even our leading medical journals are guilty of this fault. While Americans are sometimes described as bumptious and aggressive, we have been guilty of not giving due credit to our scientific men, at least as far as literature goes. "Honor to whom honor is due."

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THE CCC CAMPS

ALL those interested in public health have been watching with much interest some of the efforts being put forth by the New Deal. Pretty nearly all of these have had a shower of brickbats thrown at them, some perhaps deservedly. One great exception is the CCC camps.

There was much incredulity when these were organized, the first one being near Luray, Va., in 1933. Since that time the number has increased to 1,643.

Attempts to get accurate figures from Washington have failed. There can be no doubt, however, that upward of 500,000 young men have been directly affected through their experience in these camps. Their moral tone has been raised, their health improved, and much done in the way of education to fit them for citizenship. It is known that thousands of young men have left home and have been tramping all over the country for want of something better to do. The CCC camps have helped in this situation, though much remains to be done.

Apart from the men themselves, it is stated that 315,000 families have received from $22 to $25 a month from the young men in the camps whose basic pay is $30 a month. It is safe therefore to say that considerably more than a million people have been directly helped through the operation of this Corps. It has overcome the incredulity and opposition felt at the beginning, and seems to have won a high place in the estimation of the public.

PUBLIC HEALTH EDUCATION*

"Whereas . . . Be It Resolved"—The resolutions passed at the Pasadena meeting of the A.P.H.A. may well be scrutinized for leads by him who writes or speaks—as well as by him who plans in the department or association.

Some of the resolutions seemed to point to popular health education subject matter. Some resolutions become copy material only after they have been passed upon in relation to department policies and programs. But they are worth looking into.

The Unusual at Pasadena—The space available for scientific and educational exhibits was so generous and the response was so enthusiastic as to set a new record in extent and variety of material for study offered to delegates. Doubtless many of us will look forward to what will be available at Milwaukee in 1935. *It all depends upon what the public and private agencies—national, state and local—will plan for during the months ahead.*

Flashes and Close-Ups—At Pasadena we caught flashes of ideas and projects which have not been revealed to health education workers in other states and cities. We managed to take a few notes and hope to write a few letters. But such efforts by the editor will cover but a small section of the unknown.

Why not be able to say: "We do our part" and "We have shared"?

We are sure that *Journal* readers would value details of the colored-paper-on-map technic developed by Guy P. Jones, and the staff information service conducted by Miss Brown of the Los Angeles County Department, and Virginia Wing's "charm" campaign, and some details of what Dr. Galdston hinted at in the Members' Meeting. These are but samples of what we hope to receive from readers in all states and provinces *and* countries.

Give us close-ups, please.

"There Are No Dull Subjects"?—Signed "Little Sunshine" comes a flareback from the quotation in the September issue of the *Journal:*

> There is something about your column that always incites me to comment.
>
> On a busy day in the early fall I picked up your respected contribution to the *A.J.P.H.* (page 979) and what hits me in the face—me, a struggling, overworked, dried out editor? (Quote) There are no dull subjects; only dull writers (Unquote, and insert "there are" before second "only")! Slap! Just like that. All right. I challenge you.
>
> Write me a brief very undull description of the aims of your A.P.H.A. department: Public Health Education.
>
> Thank you.
>
> I now take the great liberty of reversing your quotation and replacing the emphasis, to wit, namely:
>
> "There are no dull writers; there are only dull subjects which have been placed in this world to eliminate all but the good writers." The trick then is to avoid the dull subjects lest they prove your Waterloo.

Who will be knight for the editor fair and take up this challenge? Who will write that "undull description of the aims" of the Public Health Education Section?

Possibly we should first set down those aims—dull or undull—unless

* Please address questions, samples of printed matter, criticism of anything which appears herein, etc., to Evart G. Routzahn, 130 East 22d St., New York, N. Y.

someone will both set the aims and describe them.

In another month or so the editor of this department will think up worthy awards for any and all who take up this challenge on his behalf. We await chivalrous volunteers.

A Course in Adult Health Education—Master of Science in Public Health will be conferred on students of adult health education by the University of Michigan. "Graduate Programs in Public Health: 1934–1935–1936" announces the following course of study, with hours of credit noted at the right:

First Semester

Hygiene 201, Physiologic Hygiene—3
Hygiene 204, Vital Statistics—3
Education B182, Current Studies in Adult Education—2
Journalism 101, Feature Writing—3
Sociology 121, Community Problems—2
Speech 131, Advanced Public Speaking—3
—total hours—16

Second Semester

Hygiene 202, Community Health Problems—3
Hygiene 206, Public Health Law and Administration—3
Hygiene 210, Adult Health Education—2
Journalism 56, Community Newspaper—3
Sociology 147, Social Psychology—3
—total hours—14

Courses recommended for substitutions and additional preparation:
Journalism 51, 52 (prerequisites), Journalism 55, 102
Speech 132, Advanced Public Speaking
Sociology 111, 113, 116, 132, 147
Political Science 141, 142, Municipal Government
Hygiene 102, 107, 115, 118, 208, 209, 211
Education C102, C108, A125, A207

For further information, write to Dr. John Sundwall, Division of Hygiene and Public Health, University of Michigan, Ann Arbor.

At Your Finger Tips—Literally so is much health information through the Health Knowmeter which originated with the Association of Women in Public Health.

Hundreds of classified facts are supplied in question and answer form on mimeographed sheets. This material may be clipped and pasted on cards and filed for easy, quick reference by teachers and others. Address: Mary R. Lakeman, M.D., Health Knowmeter Comm., 100 Nashua St., Boston, Mass.

The American Medical Association has prepared for display at fairs, expositions, etc., questions and answers taken from *Hygeia* and copied on visible index cards.

This idea might be worked out by a teacher or health worker, clipping or copying questions and answers from a file of *Hygeia*.

"Why Not Let Them Die?"—"Health education needs a good housecleaning to do away with many superstitions that have grown up around it. In *Journal of Outdoor Life*, June, 1934, and again in *Michigan Out-of-Doors*, Lansing (July-Sept., 1934), Dr. Warren Forsythe discusses this subject.

The popular understanding of personal health rules needs a lot of debunking by the application of science.

Much of the traditional subject matter of personal hygiene has no better basis of truth than folklore, half baked ideas or personal opinions associated with an emotional bias.

Observations at Pasadena—Here is the first reply to a request for observations of the Public Health Education Section in action:

What seemed important to me:

The varied interests of those who attended the section meetings.

That increasing thought must be given to enriching Section programs because of these varied interests.

A consciousness of those who attended that most public health activities have a health education content.

That large numbers of persons are interested in technics and materials.

Another commentator noticed that

certain speakers and some of the participants quite forgot the theme of the session. Or, possibly they simply took the opportunity to "get something off their chests."

A lack of an eager curiosity was noted by this same observer. Few speakers can anticipate all of the needed practical angles of what they present. Usually questions from the audience are needed to secure well rounded presentations. And usually, there were not enough of such questions. Did the speaker fail to interest us? Were we willing to guess at what was left unsaid? Did we fail to note the omissions? Were we sitting without thinking, waiting to be filled up without effort on our part?

Nevertheless, adds the editor, we had good papers; many eager, enthusiastic audiences; and the very special privilege of meeting numerous western comrades who seldom venture to the eastern meetings.

They Did Bring Address Cards—But some of the printed address cards left at Education and Publicity Headquarters at Pasadena *named no city*. We have seen a few letterheads, annual reports, and even survey reports with no mention of a city. What amazing modesty.

Teaching in a Clinic—How to make the most of a clinic for health education? One answer is given by Frances F. Hagar in a discussion of the most productive nursing service with a limited personnel:

> Probably the most important function of the clinic is teaching. This is a point that will bear a most searching and intelligent study. Consider the whole set-up of the clinic. Is it planned so that the teaching may be done in a systematic manner? Has the nurse delegated responsibilities to her assistants in such a way that she is free to supplement the teaching of the doctors and to explain matters which might be somewhat confusing to some persons? Is the teaching conducted along such a line that it might replace the costly home visit? How much demonstration material is used for teaching? A certain amount can always be used to advantage. Is group teaching a practice? The group conference is a very practicable method of teaching. Through discussion, many points are stressed which might be lost in the individual conversation. The group conference combined with the individual conference is particularly well adapted to the antepartum service.
>
> In order to make clinics more productive, then, might it not be worth while to have a critical analysis of this service. Study it from all angles to see where it might be improved in the matter of time and work of personnel, as these relate to the amount of service which can be rendered in a given community.

In *Child Health Bulletin*, Am. Child Health Assn. (Sept., 1934), 50 W. 50th St., New York, N. Y. Single specimen copies to non-members, *10 cents*.

Fewer Figures, More Interest—A recent state fair exhibit of Ohio State Department of Health was

> . . . not so elaborate, or diffuse, as some that have gone before, and did not run so much to statistics as most of them; but it spoke its piece in easily understandable language, and drew—and held—the crowd accordingly.
>
> New among its features, a real "sign of the times," was the occupancy of a booth in the departmental space in the Manufacturers' Building by official representatives of the Ohio Federation of Women's Clubs, who distributed several thousand pieces of literature, including as major items material on children and diets and the three major degenerative diseases—cancer, heart disease and diabetes. Their presence in the departmental space is the first step in the Federation's campaign in promotion and support of official health agencies, state and local.
>
> Departmental literature was handled at the other end of the departmental display, and a large sheaf of signed requests resulted, calling for several thousand pieces of printed health material. . . .
>
> An attractive model of a modern sanitary swimming pool attracted much attention and resulted in many questions. Vital statistics was presented in a few crisp statements of fact, instead of in many columns of figures. The essential facts sought to be enforced

were "driven home" under the new method in a way which no column of figures could do. The new method, therefore, is a great improvement over the old.

Chest films of tuberculosis, in shadow-boxes, added much interest to the display of the Bureau of Tuberculosis, which was not without other attractive features. The departmental laboratory was another division which made the major part of its display in new guise. Instead of having several microscopes, worth hundreds of dollars, on the table for the curious to use in exploring the depths of drops of water, blood, etc., for "bugs" and corpuscles, there were drawings in color of the microscopic field, showing the different types of germs, drawn to scale and of large size, prominently displayed. . . .

Dr. Johnson's model sanitary privy, built on the grounds northwest of the building which housed the other features, attracted a constant stream of visitors and, coupled with the placarded table of materials and costs, and explanations by those in charge, resulted in the actual sale of many and the probable sale of several thousand. These privies are being constructed as a feature of federal relief work in more than 60 Ohio counties. . . .

Other divisions of the department were represented by "small but effective displays."

"Three Health News Features" —Under this heading, in *News Bulletin* of Social Work Publicity Council, (Sept., 1934), 130 E. 22d St., New York, N. Y., appears the following:

A series of brief health editorials are being supplied to the *Cincinnati Times-Star* by the Cincinnati Public Health Federation. They appear every day under the heading "Save a Life," and a tailpiece "Perhaps Your Own." Monotony is avoided by having the articles cover all sorts of subjects connected with public health, including the prevention of accidents, particularly motor ones. A typical one reads:

"About 60,000 people die annually in the United States of pneumonia. A great many of these deaths could be prevented if people would take better care of themselves. A bad cold is often the forerunner of pneumonia. If you catch a cold, don't neglect it. Go to bed if you can, but above all don't perform exhausting work, remain in a draft, or subject yourself to exposure in bad weather. And call your doctor promptly if there is fever."

Starting in mid-August, out in Honolulu, the *Hawaii Hochi,* a daily newspaper published in Japanese and English is running a biweekly two-page child health supplement, sponsored by Palama Settlement and the local Tuberculosis Association. We are watching with interest, as other plans of this kind have not always worked out successfully. So much depends on the delicate balance of good faith from both sides. James G. Stone writes us: "We sense the possible danger of unreliable advertising, so it has been agreed that all advertising copy for this special supplement shall also be approved by us. The names of potential advertisers are being submitted to us for approval before the advertising department makes the contact with the advertisers. All proprietary remedies have been definitely ruled out."

A restrained factual article, "Plague," in the *Baltimore Evening Sun,* Aug. 13, 1934, shows H. L. Mencken in a new mood. He discusses in useful paragraphs the problems in the control of syphilis. He even mentions social workers without any derogatory comments: "Since the War it (syphilis) has been widely discussed by medical men and social workers, and the old taboo upon any mention of it has largely broken down." This change in the general attitude toward syphilis and the change on the part of the medical profession so that the regulations on reporting it to health departments are being more carefully followed out are the bases of Mr. Mencken's article. His name, as author, should have a good deal of weight with Baltimore newspaper readers.

Getting Acquainted with County Commissioners — A possible weak point in the support of the public health agency is the educational work done with legislative and budget-making bodies—city, county and state.

Dr. C. H. Douthirt states some examples of omission, then says:

I suggest that every health officer in the state attend every regular meeting of the county commissioners. It isn't necessary to stay all day, but go in, sit down with them and discuss the health work in the county. Tell them what you and the nurse are doing, your plans and problems; give them copies of your reports to the state and your mileage reports. Ask for suggestions and criticisms. Tell them you want to coöperate with them and then show that you mean it by attending their meetings. Get acquainted with your county commissioners; they are all good fel-

lows, and more than that they have been selected by the people to run the business of the county.

In *New Mexico Health Officer*, Santa Fe, Aug., 1934.

Where to Write for Help—Some teachers may be encouraged to seek supplementary references and materials for their classes. Other teachers are compelled to seek whatever material they need because none is officially provided or suggested.

In *Hygeia* (Oct., 1934) Dr. Thomas D. Wood says:

> Under any circumstances finding the best helps for health teaching is a stimulating, challenging and somewhat difficult or complicated game for the classroom teacher.

Dr. Wood tells of the part taken by supervisors or counsellors, when there are such. Then

> Health knowledge as differentiated from health teaching methods involves a wide range of authentic information regarding the many aspects of health.

The sources for such material discussed by Dr. Wood include governmental agencies, national health and welfare associations, commercial or business organizations, and popular monthly and weekly as well as daily periodicals. Some of the pitfalls are pictured.

> To those who may consider the suggestions or advice in this article lacking in definiteness, let it be confessed that the writer believes firmly that teachers in many instances cannot be sure of the best places to look for help for health teaching without expert advice in this field, which is fundamentally the most important and at the same time the least exact of the applied sciences.

We are glad that Dr. Wood has emphasized this need of "expert advice." There was no space for him to have gone further, but we hope that he or someone else will attempt to point out in a future article just how teachers may go about getting the right kind of help from local and other authorities, and how local groups of teachers may make up for the absence of competent supervisors.

October, 1934, Hygeia—Here are a few of the topics presented in this issue:

> What is sinus trouble? (how it may be prevented, what to do for it). The handicapped child (what the parent should and should not do). Food fads and faddists (a debunking of some well known diet theories). The head louse (one of Our Parasites). Common sense in mouth care (about brushes and brushing). New books on health. Questions and answers.
>
> School and Health includes: The place of the textbook in health education. Where may teachers look for help in health teaching? New health books for teachers and pupils.

Syndicated Health Education—The annual "Directory of Features" in *Editor and Publisher*, Times Bldg., New York, N. Y., lists health columns by the following authors now being sold to newspapers by syndicates and services:

> Drs. Logan Clendening, Morris Fishbein, Royal S. Copeland, Sophia Brunson, W. F. Thomson, Iago Galdston, William Brady, Michael Shuman, H. J. Hoare, C. N. Chrisman and James W. Barton—and Dr. Frank McCoy. (Sept. 29, 1934. 10 cents.)

Damaged Lives No Longer Sponsored—Next month we will explain how undesirable promotion of the "Damaged Lives" motion picture has caused American Social Hygiene Association to withdraw its sponsorship.

Please report to the Association, 50 West 50th St., New York, N. Y., any showings of the picture.

CORRECTION

Under "Magazine Articles" (June, 1934) the price of *Today* should be *10 cents* a copy.

DISCONTINUED

Health Officers' World, Milwaukee, has been temporarily discontinued, and no copies are available of issues we have mentioned.

EVENTS AHEAD

Roll Call of the American Red Cross in November, and the Christmas Seal Sale of tuberculosis associations in December are of special interest to health agencies.

The 1934 Mobilization for Human Needs, Oct. 28 to Nov. 11, particularly concerns health agencies in community chest cities.

The National Tuberculosis Assn. announces that it sent to state tuberculosis associations early in September samples of the materials to be used in the E.D.C. for 1935. The slogan and keynote: "Fight Tuberculosis With Modern Weapons." Objective: to spread information about treatment.

Quackery and fads still thrive; worn out theories and health fetishes still obstruct scientific treatment. It is our opportunity to dispel the unsound and displace it with the exceedingly hopeful story of modern treatment

We now enter the season of state social work conferences. Probably all of them will have one or more health sessions. They are not likely to give time to health education unless health workers in the states take the initiative.

FOR EDUCATION AND REFERENCE

"Half a Century of Warfare against the Typhoid Fever Bacillus" is a brief summary, with diagrams, offering usable material for copy. *Statistical Bulletin*, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y.

Monthly Letter, Housing Information Bureau, Welfare Council, 122 E. 22d St., New York, N. Y., is a mimeographed bulletin with housing news from all over the country, and rather full mention of books, pamphlets and articles. *$1.00* a year. Sample *free*.

It is a comprehensive analysis of a study by selected teachers over 6 weeks concerning 3,512 unselected pupils in 58 centers in upstate New York. It reveals deficiencies to be especially marked regarding habits of sleep, bathing and hand-washing, dental hygiene, balanced diet, over-fatigue.

Two reprints from Milbank Memorial Fund, 40 Wall St., New York, N. Y., copies free:

"A New Deal in Health Education," by Bertrand Brown.

"An Experiment In Health Education In Chinese Country Schools," by C. C. Chen, M.D.

Reprints and other pamphlets are offered by National Society for the Prevention of Blindness, 50 W. 50th St., New York, N. Y.:

"Activity Program in Sight-Saving Classes." *5 cents.*

"Automatic Light Control in the Modern School." *5 cents.*

"Eye Hazards in Play." *5 cents.*

"First Eyeglasses at Middle Age." *5 cents.*

"Light and Vision." *10 cents.*

"Preventing Blindness Through Social Hygiene Coöperation." *10 cents.*

"A Program of Eye Health in a School System." *10 cents.*

"The Romance in the Movement for the Prevention of Blindness." *10 cents.* "Great causes begin with great personalities."

"Safe and Sound." Syphilis blood test for expectant mothers.

"Trachoma in the United States." *10 cents.*

"Vocational Guidance for Children with Defective Vision." *10 cents.*

Single copies of the above *free* to health workers.

INFORMATION WANTED

American Social Hygiene Assn., 50 W. 50th St., New York, N. Y., would

. . . like to receive from social hygiene societies, hospitals, clinics, or individual workers, any data available concerning education of patients while under treatment as regards their present condition and future health. *A Popular Health Instruction* number of the *Journal* is contemplated during the fall, for which such material will be especially useful.

BOOKS AND REPORTS

Death Rates by Occupation—*By Jessamine S. Whitney. New York: National Tuberculosis Association*, 1934. 32 pp. Price, $1.00.

The almost complete lack of official occupational mortality rates by age and cause of death in the United States for any considerable number of occupations, has been a serious deficiency in our national vital statistics records. Industrial hygienists, vital statisticians, economists, labor officials, and others who have sought to determine and appraise the effects of occupations on health and longevity have suffered a handicap in mapping out campaigns for the amelioration of working conditions without this information.

In the introduction it is stated that up to this time no death rates by occupation have been available in the United States. While this is not strictly in accord with the facts, since death rates by occupation were published by the Bureau of the Census in connection with the 1890 and 1900 censuses, nothing has been published for over 30 years. These old data are probably inaccurate and certainly are not representative of present-day conditions. Mention might also have been made of the report of the Actuarial Society of America and the Association of Insurance Medical Directors entitled "Joint Occupation Study, 1928." Considerable light is thrown on the effects of occupational hazards by the death rates and ratios shown in that investigation.

The statistics published decenially by the Registrar General of England and Wales for more than 50 years have been the best guide to the effect on mortality of a large group of occupations. We have not been able to do the same thing in the United States, mainly because of two considerations: (1) there is much greater shifting from job to job in the United States, and (2) there is greater accuracy in reporting the occupation at death in England and Wales. So many persons in the United States have been classified in general and unspecified occupational groups at death who were classified in specific groups in the census, that officials have felt that death rates for most occupations would not be valid.

As a result of an educational campaign of the editor and her coworkers, it was finally possible to select 10 states with data sufficiently accurate to compile occupational mortality figures. Thirty-nine per cent of all gainfully occupied men in the United States were found in these states which included part of the industrial East, the agrarian West, and one typical southern state. The general death rate for occupied males at specified ages in the 10 states corresponded closely with those for all males in the 10 states and in the U. S. Registration Area. The tabulations made by the Bureau of the Census were, of necessity, further limited to occupied males aged 15 to 64 in 1930, 53 occupation groups in which there occurred, in 1930, 500 or more deaths, and 17 specific causes of death.

To eliminate the influence of economic status, death rates are shown by age and cause, according to Dr. Alba Edwards' grouping of social-economic classes, with the exception that agricultural workers were grouped separately.

There are 8 tables and 1 chart. Standardized and age specific death

rates from 10 causes of death are shown for the social-economic classes and each of the 53 occupations. Table 1 presents a very valuable analysis of mortality by social-economic classes such as we have not had before, showing standardized and age specific death rates for all gainfully occupied males aged 15 to 64. It is rather unfortunate that the total for men in selected occupations is included in Tables 5, 7, and 8 as the basis for comparison for each occupation instead of the total of all gainfully occupied males. The net result is to give undue weighting to occupations with higher than average death rates and thus to raise the standardized death rate for all occupied males from 8.70 to 9.10. The standardized rates for each social and economic class and for each cause of death are also affected. This fact should be kept in mind when comparing death rates for a specific occupation with the general average.

The authors, who selected causes of death from the point of view of occupational hazard, included only 3 means of accidental injury. It is impossible, therefore, to tell what part total accidents played in the total mortality or in the mortality of the socio-economic or occupational classes.

A table giving the number of workers, deaths and death rates for most of the occupations in the Census Index of Occupations is included to show the necessity of selection for detailed study and to present significant figures for occupations excluded because the number of deaths was under 500. With the limitations of this table kept in mind, it will undoubtedly be of value. However, some measure of the position in the mortality scale, either through standardized death rates or ratios of actual to expected deaths might have been given for the larger occupations not included in the detailed study, especially where there was a high degree of correspondence between the reporting on the census schedules and death certificates.

The comments of the authors on the tables are instructive but limited. Comments on the credibility of rates such as 910 for clerks (except those in stores), 772 for clerks in stores, and 693 for bookkeepers, cashiers, and accountants would have been helpful.

In spite of its inherent limitations, this report is a valuable addition to the all too meagre body of American statistics on occupational mortality. The data for social-economic classes are especially useful. Possibly the chief value of the work lies in the fact that it will keep alive interest in occupational mortality statistics in the United States and that it will serve as a groundwork for future studies. The difficulties which had to be overcome before this study could be accomplished were almost insurmountable. A debt of gratitude is owed to Miss Whitney " whose initiative, vision, and persistence made it possible." Acknowledgment is made in the report of the promotional work done by Miss Mary V. Dempsey and of the cordial coöperation and technical assistance of the staff of the U. S. Bureau of the Census.

ROBERT J. VANE

Hygiene for Freshmen—*By Alfred Worcester, M.D. Springfield, Ill.: Charles C. Thomas,* 1934. Price, $1.50.

We have read this short book with pleasure and believe that it is constructed on the right principles, beginning with some anatomy and more physiology. The discussion of prevention of disease takes up only some 15 pages, and the subject of immunity 13 pages. The book begins with an introduction, following which biology and embryology are discussed. The next 8 chapters are devoted largely to physiological considerations, taking up in order

the circulation, glands, nutrition, digestion, etc. There is a glossary which strikes us as being insufficient for the average freshman. Each chapter is followed by questions which cover the contents.

It is doubtless bold for anyone to criticise the English of a Harvard professor. However, in some places the author changes abruptly from the impersonal to the personal, even in the same paragraph. Apparently the author forgot that he was writing a book and not delivering a lecture.

Altogether the book can be commended for the purpose for which it is intended. It is well printed and bound.

MAZYCK P. RAVENEL

Text-Book of Meat Hygiene. *With Special Consideration of Antemortem and Postmortem Inspection of Food-Producing Animals — By Richard Edelmann, Ph.D. 6th Revised Edition, by John R. Mohler, V.M.D., and Adolph Eichhorn, D.V.S. Philadelphia: Lea and Febiger,* 1933. 474 pp. Price, $5.50.

A book which has gone through 6 editions has proved its value, and there is little or nothing to be criticised in the present volume. While it is dedicated to the veterinary profession, we wish very much that doctors, and especially health officers, would take more interest in this line of work, and absorb the sound scientific knowledge and advice contained in its pages. The editors have brought it up to the minute. It gives all improvements and changes in packing house methods and shipment, including the most recent knowledge concerning food poisoning and quick freezing.

Chapter IV is a reproduction of the regulations governing the meat inspection of the U. S. Department of Agriculture, including disposal of diseased carcasses, labeling, marketing, branding, reinspection, counterfeiting, exporting, imported meat and products, and the handling and inspection of horse meat. An especially interesting chapter is the History of Meat Hygiene.

The book is a mine of information and can be recommended unreservedly to all interested in this most important branch of food hygiene. We wish for it a wide circulation.

MAZYCK P. RAVENEL

Die Akuten Zivilisationsseuchen: Musern, Pocken, Keuchhusten, Scharlach, Diphtherie, Epidemische Kinderlähme — Ihre Epidemiologie und Bekämpfung—*By Dr. B. De Rudder. Leipzig: Georg Thieme, Verlag,* 1934. 286 pp., 49 figs. Price, RM. 18 bd., RM. 16 unbound.

This treatise deals with the epidemiology and control of the acute diseases of civilization, namely measles, smallpox, whooping cough, scarlet fever, diphtheria, and epidemic infantile paralysis. The author is the director of the children's clinic in the University of Greifswald, and the book is written primarily from the clinical standpoint, but with emphasis on the relations of the subject to public health and state medicine. The book aims to present the basic facts of the epidemiology of these diseases in such a manner as to bring out the deficiencies in knowledge on the subject. Details of bacteriology and serology are omitted except in so far as they are related to therapy, control, or epidemiology.

The work is so very comprehensive in its scope that no brief review can adequately present it. For example, in dealing with infantile paralysis one finds, in addition to the many general topics concerned with the disease, discussions of the origins of centers of contagion, and of carriers, the contagiousness, the index of contagion and difficulties in determining it, variations in the period of incubation, family centers,

immunity and susceptibility, immunity without evidence of illness, extra-uterine origin of immunity, age distribution of immune individuals, the division of the population into groups of differing immunological relations, abortive attacks, periodicity influence of climatic factors, summer peak, and crippling effect.

Of especial value is the extensive survey of the principles of control and prevention by isolation, disinfection, quarantine, the carrier problem, vaccination, convalescent and adult serums, and standardization of serums and toxoids.

CHARLES A. KOFOID

Grundzüge der Hygiene—*By Max Eugling. 3rd ed. Berlin und Wien: Urban & Schwarzenberg.* 448 pp., 155 figs. in text. 1934. Price, M. 10 in paper, M. 11.80 bound.

The third edition of this comprehensive and informative handbook of hygiene has undergone a thorough revision of all sections with the addition of new material. The greatest expansion is in the subject of industrial hygiene, especially in industrial poisoning, a necessary consequence of the expansion of industrial chemistry. Sections on the control of communicable diseases, and the German and Austrian regulations on notification have been added. Many additions have been made to the sections on disinfection and infectious diseases. New statistics in social hygiene and new illustrations have been added.

Few, if any, books in this field have the breadth of vision, analytical display, lucidity of presentation, and inclusiveness which one finds in Professor Eugling's handbook. Teachers of the subject will find here a comprehensive and logical presentation of all aspects of hygiene. All those interested in public health will find here many suggestions in various fields which will widen the horizon of their interests and broaden the scope of their opportunities and obligations. CHARLES A. KOFOID

Seeing and Human Welfare—*By Matthew Luckiesh. Baltimore: Williams & Wilkins,* 1934. 190 pp. Price, $2.50.

The point of view from which this book is written is that the human seeing machine should be supplied with a great deal more electric light than is ordinarily provided for it. The author undertakes to show why this is so and how the deficiency can be made up at small cost. He declares that millions of persons are being penalized every day for want of light, without knowing it, the result being a crippling of eyes, eye strain disorders, and an unnecessary expenditure of physical and nervous energy.

Seeing conditions, he says, are not necessarily adequate when the work can be done without conscious effort and with merely the required speed and accuracy. An adequate factor of safety should be provided. How large this should be or how it can be determined is not stated. Contrary to widespread belief, he says, it is hardly possible to have too much light.

Whereas an ideal condition is 1,000 foot-candles or the intensity existing in the shade of a tree a noon on a bright, sunny day, a great deal of the work of the world is done with an intensity of less than 1 foot-candle, or the light of a single candle at the distance of 1 foot. Three feet from a 100-watt tungsten filament lamp, the intensity of illumination is only about 10 foot-candles. These are called primitive conditions. The author recognizes that 1,000 candle power is more than can generally be provided in practice and would be satisfied with considerable smaller intensities, depending on the conditions under which the light would be used.

Intensities recommended by the author, without, however, stating any definite basis for them, follow. One hundred foot-candles or more for severe and prolonged tasks such as fine en-

graving; 50 or more for drafting, watch repairing and difficult reading; 20 to 50 for prolonged clerical work, reading, and bench work; 10 to 20 for office and factory work; 5 to 10 where fine details are not involved.

The low cost of current makes adequate lighting practicable so far as current is concerned, for it averages about 6 cents per kilowatt for residences and is sometimes less than that. At this rate, a 50 watt lamp has to burn 4 hours to cost 1 cent. The author says: "One can enjoy 100 foot-candles for reading an entire evening or for a large part of a day at the cost of a telephone call." The cost of installations, fixtures, lamps, and replacements are not mentioned, but often present a serious obstacle to proper lighting.

A reading of the book would convey a profound sense of the involved character of seeing, if anyone had any doubt about the matter. And it is but fair to say that the author attempts to deal with only a part of the broad topic he has chosen. He says that the science of seeing must deal with three major complexities which are interdependent and intermingled:

1. The external world of physical factors.
2. The eyes, visual sense and successive events of visual response.
3. The psycho-physiological effects pertaining to human behavior, efficiency, welfare and happiness.

The book has to do chiefly with the first of these complexities.

So far as public health workers are concerned, the principal use of the book lies in the simple way in which terms, facts, and arguments used by lighting experts are explained.

The author is director of the Lighting Research Laboratory of the General Electric Company, Cleveland. He has written over a dozen other books on subjects pertaining to light, and particularly artificial light.

GEORGE A. SOPER

Notes on Planning a Publicity Program—*By Mary Swain Routzahn. New York: Social Work Publicity Council.*

Social workers and publicity committee members looking for guide-posts to show them the way to plan a publicity program or to check over plans already afoot will find many suggestions in *Notes on Planning a Publicity Program*, just published. Mrs. Routzahn is Consultant in Social Work Interpretation of the Russell Sage Foundation.

In an informal way, Mrs. Routzahn brings up leading points for consideration in planning a program: the reasons for year-round programs; what publics the program tries to reach; what to tell; the forms in which information is available; and various publicity channels evaluated in relation to the public.

The pamphlet can be secured from the Social Work Publicity Council, 130 E. 22nd Street, New York, N. Y., for 15 cents per copy.

BOOKS RECEIVED

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EXERCISE WITHOUT EXERCISES. By S. Arthur Devan. New York: Dodd, Mead, 1934. 84 pp. Price, $1.25.

THE ART AND PRINCIPLES OF NURSING. By Amy Elizabeth Pope and Virna M. Young. New York: Putnam, 1934. 832 pp. Price, $2.75.

MENTAL HYGIENE AND EDUCATION. By Mandel Sherman. New York: Longmans, 1934. 295 pp. Price, $2.25.

THE MOTHER'S ENCYCLOPEDIA. Compiled and Edited by the Editors of The Parents Magazine. New York: Reynal & Hitchcock, 1933. 959 pp. Price, $3.00.

MICROBIOLOGY AND ELEMENTARY PATHOLOGY. For the Use of Nurses. 2d ed. By Charles G. Sinclair. Philadelphia: Davis, 1934. 377 pp. Price, $2.75.

THE CHILD. HIS ORIGIN, DEVELOPMENT AND CARE. By Florence Brown Sherbon. New York: McGraw-Hill, 1934. 707 pp. Price, $3.50.

CURRENT PROBLEMS IN CAMP LEADERSHIP. A Workbook for Camp Counselors and Directors. Edited by Jackson R. Sharman, Marjorie Hillas and David K. Brace. Ann Arbor: Ann Arbor Press, 1934. 120 pp. Price, $1.25.

YOUR CHILD IS NORMAL. The Psychology of Young Childhood. By Grace Adams. New York: Covici Friede, 1934. 241 pp. Price, $2.00.

CHILD LABOR. Bulletin of the Russell Sage Foundation Library. New York: Russell Sage Foundation, 1934. 4 pp. Price, 10¢ a copy. 50¢ a year.

THE FAMILY. By M. F. Nimkoff. New York: Houghton Mifflin, 1934. 526 pp. Price, $3.00.

HUMAN NATURE. A Guide to Its Understanding. By Judson Rea Butler. New York: Greenberg, 1933. 174 pp. Price, $2.00.

PRACTICAL EVERYDAY CHEMISTRY. By H. Bennett. New York: Chemical Publishing Co., 1934. 305 pp. Price, $2.00.

THE HOUSING PROGRAM OF THE CITY OF VIENNA. By Charles O. Hardy and Robert R. Kuczynski. Washington: The Brookings Institution, 1934. 142 pp. Price, $2.00.

WISH-HUNTING IN THE UNCONSCIOUS. An Analysis of Psychoanalysis. By Milton Harrington. New York: Macmillan, 1934. 189 pp. Price, $2.50.

RECENT ADVANCES IN ALLERGY. 2nd ed. By George W. Bray. Philadelphia: Blakiston, 1934. 503 pp. Price, $5.00.

NATURE'S WAY. By Victor C. Pedersen. New York: Putnam, 1934. 81 pp. Price, $1.00.

NURSING SCHOOLS—TODAY AND TOMORROW. Final Report of the Committee on the Grading of Nursing Schools. New York: Committee on the Grading of Nursing Schools, 1934. 268 pp. Price, $2.00.

AN ACTIVITY ANALYSIS OF NURSING. By Ethel Johns and Blanche Pferferkorn. New York: Committee on the Grading of Nursing Schools, 1934. 214 pp. Price, $2.00.

TUBERCULOSIS OF THE LYMPHATIC SYSTEM. By Richard H. Miller. New York: Macmillan, 1934. 248 pp. Price, $4.00.

GERMICIDAL VALUE OF PURE SOAP. By F. A. Diasio, B.A., M.D. Reprinted from *Medical Review of Reviews*, August, 1934. 16 pp. Free distribution by Procter & Gamble Company, New York, N. Y.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

John Bull's Children—The growth of the preventive aspects of school medical service in England is recounted. There the school child health supervision is much more closely allied to the other services which make up the general program of health improvement than is at present possible in this country.

ANDEN, G. A. School Medical Inspection in England. Child H. Bull. 10, 5:149 (Sept.), 1934.

Comparative Mortality—Industrial workers have mortality rates greatly in excess of those higher in the economic scale; unskilled workers have the highest. Tuberculosis, pneumonia, and accidents are chiefly the cause. In England the difference is even more marked than here.

BRITTEN, R. H. Mortality Rates by Occupational Class. Pub. Health Rep. 49, 38:1101 (Sept. 21), 1934.

British Care of the Tuberculous—Early diagnosis and after-care of tuberculosis are the problems in Great Britain as they are here. Hence, what is being done there is of interest to us, too.

BURTON-FANNING, F. W. Our Difficulties in

the Conflict Against Tuberculosis. J. State Med. 42, 9:497 (Sept.), 1934.

Do People Die of the Heat?—Exceptionally high death rates appear to be associated with exceptionally high temperatures in a study made of conditions during the recent middle western drought.

COLLINS, S. D. Maximum Temperatures and Increased Death Rates in the Drought Area. Pub. Health Rep. 49, 35:1015 (Aug. 31), 1934.

Mottled Enamel of Teeth—Infinitesimal amounts of sodium fluoride in drinking water—25 p.p.m.—produce changes in the teeth of rats, an indication of how small a dosage will injure teeth of humans as well.

DEAN, H. T., *et al.* Effect of Various Amounts of Sodium Fluoride on the Teeth of White Rats. Pub. Health Rep. 49, 37:1075 (Sept. 14), 1934.

When Budgets Are Cut—Intended to serve a local situation, the consideration of essential health administrative measures broadens out to make a most valuable and generally useful document.

EMERSON, K. Essential Public Health Services. New Eng. J. Med. 211, 10:451 (Sept. 6), 1934.

Something New Under the Sun—Sonne dysentery is endemic, of increasing incidence, and may change in epidemic form to affect more adults than in the present stage (in which it is confined largely to children).

FELSEN, J., and OSOFSKY, A. G. Sonne Dysentery. J.A.M.A. 103, 13:966 (Sept. 29), 1934.

When Youngsters Whoop—Vaccination with pertussis antigen reduced the severity of the whooping cough attacks, as compared with a control group, among children who contracted the disease after exposure.

FRAWLEY, J. M. The Immunization of School Children Against Whooping Cough. J.A.M.A. 103, 13:960 (Sept. 29), 1934.

More Praise for Breast Feeding—Among 20,000 babies cared for by the Chicago Infant Welfare Society, the morbidity rate of the artificially fed was nearly double the sickness rate of the breast-fed children, and the mortality rate ten times greater. Breast feeding is still the most potent protection against diseases of infancy.

GRULEE, C. G. Breast and Artificial Feeding. J.A.M.A. 103, 10:735 (Sept. 8), 1934.

School Nursing Good and Bad—Information about the performance of school nurses is set forth in the survey by the N.O.P.H.N. There is much worth while discussion of the conditions and problems revealed.

HILBERT, H. Public Health Nursing Service to School Children. Pub. Health Nurs. 26, 9:461 (Sept.), 1934.

Rheumatic Children—Tonsillitis or sore throat was the preceding infection in 60 per cent of the 1,200 rheumatic children studied; and respiratory infections are an important factor in recrudescences of rheumatic phenomena.

KAISER, A. D. Factors that Influence Rheumatic Disease in Children. J.A.M.A. 103, 12:886 (Sept. 22), 1934.

Do We Need Cancer Propaganda—Urging the need for better medical preparation for early diagnosis of cancer, the author minimizes the need for more lay education with the opinion that probably there are few individuals over twenty-one who have not heard about cancer.

MACCARTHY, W. C. The Cancer Problem Today. J.A.M.A. 103, 13:957 (Sept. 29), 1934.

Praise for Raw Milk—Copious evidence, almost amounting to proof, is at hand that raw milk taken by children and growing boys and girls acts as a preventive of dental caries: pasteurization of milk reduces its nutritive value: small doses of bovine tubercle bacilli protect against human type infection;

undulant fever from cows is uncommon anyway; streptococcic mastiditis has never been proved pathogenic to man; the cow is becoming too civilized an animal. These are the suggestions set forth by the Director of Dental Studies of the London Hospital.

SPAWSEN, E. Raw Milk and Sound Teeth. Pub. Health, 47, 12:388 (Sept.), 1934.

Dental Hygiene and Health—Providing free dental care for 9,400 poor children in New York, emphasizing preventive features, and training a large group of dental hygienists is the impressive record of the Guggenheim clinic for last year.

MCCALL, J. O. Dental Care as a Health Measure. Child H. Bull. 10, 5:158 (Sept.), 1934.

Strengthening Weak Spots in Nursing—How federal and state health authorities may contribute to improving the public health nursing services concludes this interesting discussion of the findings of a recent survey of public health nursing.

MCIVER, P. Some Findings of the N.O.P.H.N. Survey of Public Health Nursing of Significance to State Health Administrators. Pub. Health Rep. 49, 37:1081 (Sept. 14), 1934.

Tests for Dangerous Dusts—Another paper revealing that the response of the peritoneal tissue to various dusts can be used as a test to determine the possible harmfulness of an industrial dust.

MILLER, J. W., *et al.* Response of Peritoneal Tissue to Dusts Introduced as Foreign Bodies. J.A.M.A. 103, 12:907 (Sept. 22), 1934.

Encephalitis Virus Transmitted Experimentally—Virus from the brain substance of persons dying during the St. Louis encephalitis outbreak can be carried through white mice; it is neutralized by convalescent serum but not by normal serum or convalescents from Japanese or Australian varieties of this disease.

MUCKENFUSS, R. S., *et al.* Etiology of the 1933 Epidemic of Encephalitis. J.A.M.A. 103, 10:731 (Sept. 8), 1934.

Of Interest to Health Department Laboratories—Described in detail and well illustrated is the laboratory equipment developed in an attempt to improve existing sanitary engineering laboratories.

REDDICK, T. M. Some Developments in Sanitary Engineering Laboratory Equipment at New York University. J. Am. W. W. Assn. 26, 9:1238 (Sept.), 1934.

Child Hygiene Program Weaknesses—Current child health projects are scrutinized and the weaknesses are pointed out. The conclusion is that child hygiene is not an entity. State health departments should provide leadership in maternal and child health as a part of a whole community health promotion program.

WARNER, E. F. Child Health Activities in a State Department of Health. Pub. Health Rep. 49, 36:1056 (Sept. 7), 1934.

ASSOCIATION NEWS

SCIENTIFIC EXHIBITS IN PASADENA

THE best Scientific Exhibits which have ever been sponsored by the American Public Health Association were shown in the Exhibition Hall of the Civic Auditorium during the period of the 63rd Annual Meeting in Pasadena. Eighteen organizations participated, covering 3,000 square feet of space with exhibits of their valuable contributions to public health, ranging from the simplest of gadgets to make easier the work of the health department personnel, to the extensive exhibit imported from the Dresden Museum of Hygiene in Germany especially for this meeting.

There was also included in this exhibit Mr. Routzahn's well known education and publicity display. This needs no introduction or description for it has been an indispensable part of Association meetings in the past. Delegates never fail to attend it, and its popularity is, without doubt, well deserved.

The exhibit from the Dresden Museum of Hygiene dealt primarily with the subject of Eugenics. Although the subject matter was interesting, the exhibit was important principally as a demonstration of methods of presentation which have been developed to such a high degree by the Museum through many years of study. Pictures and models were used extensively. Printed material was conspicuous by its absence, the briefest of titles being used to explain the subject matter so adequately depicted in the photographs and models. A number of valuable suggestions in effective exhibit methods were offered to those particularly interested in health education.

The delegates manifested great interest in the exhibit. It is planned to display this material in several cities throughout the country, which will give an additional number of health workers an opportunity to study it.

The gadget exhibit comprised contributions from several health departments, including the city and county of Charleston, S. C., the New York City Health Department, Buffalo Health Department, and the Los Angeles County Health Department. The exhibit was comprised chiefly of simple devices which have originated in the administrative offices or laboratories of these health departments and have been found useful and helpful in expediting their work. Typical examples of these gadgets are a convenient rack for baskets of test tubes, an inexpensive animal board, and a deep water sampling outfit. These gadgets were suggestive for the creation of many other similar devices to those who viewed them.

The exhibit of the City of Pasadena covered several phases of their work and included a three dimension model of the Morris Dam with a continuous flow of water over the spillway, pictures showing details of the activated sludge plant and the processing of fertilizer manufacture, an illuminated series illustrating the work of the Tumor Clinic, and a presentation of Pasadena's poliomyelitis control in 1934.

The California Tuberculosis Association included in its display an illumi-

nated frame showing X-ray pictures and a neon chart entered by the California Medical Association illustrating the reduction in the death rate from tuberculosis since 1906.

California was further represented in the exhibit by contributions from the State Board of Health, the George Williams Hooper Foundation, the Los Angeles County Health Department, and the Los Angeles City Health Department.

The State Board of Health included pictures and graphs showing the historical development of the Board, also plague demonstration material, demonstration of biologics prepared by the State Hygienic Laboratory, and a graph showing the history of plague in California.

The George Williams Hooper Foundation of the University of California had a graphic display of the epidemiology of brucella infections, relapsing fever, psittacosis, and rickettsia infections.

The Los Angeles County Health Department, the most unique county department in the United States, portrayed its work through a selected series of charts and photographs emphasizing particularly their health centers, medical social service, dental hygiene, and communicable disease control activities.

The Los Angeles City Health Department had a very realistic exhibit from its rodent control division showing the application of ratguards to ship mooring lines at the harbor, and demonstrating the impossibility for a rat to make its way to the dock. It included, also, a demonstration of the Palm Tree Rat Exterminating Truck. Rat extermination in palm trees being a problem unique in Southern California since, contrary to popular belief, the palm tree affords an almost perfect harborage for rats.

The ground squirrel poisoning method —by means of poisoned grain and carbon bisulphide gas—was demonstrated by constructing in detail a section typical of squirrel infested territory both the surface and the ground below, with material and equipment in action.

The Bureau of Housing and Sanitation, Milk Division, and Fruit and Vegetable Division were represented by various pictures, charts, and models of their work. Among the latter were two outstanding educational models; one—"The Perfect Restaurant"—a miniature of a restaurant showing all building features, fixtures, kitchen, dining room, and toilet arrangement as required by the city ordinances. The other—"A Model Refrigerator Car"—a perfect replica of the well known orange colored "Freeser Cars" employed in transporting fruit and vegetable products under ice or special ventilation.

The Medical Section of this Los Angeles City Exhibit included a model of a classroom of the Post Graduate Nurses' course in obstetrical procedure from the Nursing Division, a model of a Neo Salvarsan Clinic for the treatment of syphilis from the Women's Venereal Division, a bacteriologic laboratory exhibit of the poisonous "Black Widow" and common garden spiders, and an exhibit of charts from the Epidemiological and Quarantine Sections illustrating the behavior of the 52 diseases "Reportable" under the law of California.

In addition, wall maps and charts of the organization, were on display.

The Scientific Exhibits included two others of particular interest; one, on eugenic sterilization, summarizing a study of the 10,000 patients who have been sterilized in California during the past 25 years. The other, by the U. S. Public Health Service, illustrating by means of photographic transparencies the developmental cycle concerned in the application of mosquito salivary glands in malaria therapy. This method is designed to replace the transfusion of

blood and the use of live mosquitoes in the treatment of paresis. Used as a culture, the extracted glands have been kept alive for 21 days.

In addition to the inside exhibits, two motor units were shown on the plaza immediately adjacent to the Exhibition Hall. The Santa Barbara mobile dental unit is an automobile trailer with full dental equipment, including compressed gas for heating and sterilizing instruments, running water, and electric power from storage batteries. This is used for teaching and demonstrating hygiene of the mouth as practised in the schools of remote and mountainous districts. The second motor unit was the mobile squirrel dissection laboratory of the State Health Department. Demonstrations of squirrel dissection were given daily and proved of great interest to many visitors.

The success of the Scientific Exhibits was in a considerable measure due to the splendid work of the Pasadena Committee and particular credit goes to Mr. Charles W. Arthur, Pasadena Health Department for his devoted and capable service in managing the exhibit and directing its installation.

The 64th Annual Meeting is looming ahead and the Committee on Scientific Exhibits is already looking forward to another Scientific Exhibit, at least comparable, if not better than that at Pasadena.

HOMER N. CALVER, *Chairman*
Committee on Scientific Exhibits

BROADCASTING AT A.P.H.A. MEETINGS

SEVERAL years ago it was decided to make use of the radio at our Annual Meetings for the broadcast of public health information. The matter was arranged by Dr. F. O. Tonney, Radio Adviser to the President's Committee on Radio of the A.P.H.A. At the recent meeting in Pasadena, 23 radio speakers were engaged, the names of which appear in our program of the meeting. There were 23 broadcasts made, of which 20 were over the Don Lee Broadcasting System on the Pacific Coast, with 13 to 16 stations reaching as far to the East as Denver. Three of them were on a National network of 50 stations, covering the central and eastern states. Dr. Tonney reports that many responses from the audience are coming in.

SOUTHERN BRANCH ANNUAL MEETING

THE Third Annual Meeting of the Southern Branch of the American Public Health Association will take place in San Antonio, Texas, on November 13 and 14, in conjunction with the Southern Medical Association, which meets from November 13 to 16.

An excellent program of two morning sessions and two afternoon sessions has been arranged. Some of the subjects to be presented are: The Objectives and Possibilities of the Public Health Movement in the South, by A. T. McCormack, M.D.; Tuberculosis Control, by I. C. Riggin, M.D.; Tennessee Valley Authority, by E. L. Bishop, M.D.; Newer Approaches in Health Education, by Henry F. Vaughan, Dr.P.H.; The Use of the Untrained Nurse in Emergency Public Health Work, by Pearl McIver, R.N.; CWA–ERA Malaria Control Program in the South, by L. L. Williams, Jr., M.D.; Recent Sanitary Improvement Projects with Public Funds, by V. M. Ehlers, C.E.; Depression Effects on Typhoid Epidemics, by J. N. Baker, M.D.; The Efficacy of Typhoid Prophylaxis in the United States Army, by Robert U. Patterson, M.D.; The Efficacy of Typhoid Prophylaxis in the United States Navy, by S. S. Cook, M.D.; Some of the Public Health Problems in Texas and How They Are Being Met, by John W. Brown, M.D.; Diph-

theria Immunization, by A. H. Flickwir, M.D.; and The Prevailing Reduction in Public Health Budgets in Texas and What Is to Be Done About It, by J. W. Bass, M.D.

All southern health workers interested in public health progress are invited to attend the meeting and participate in the discussions. For further information write to Dr. G. Foard McGinnes, Secretary, Southern Branch, State Department of Health, Richmond, Va.

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

Monroe F. Brown, M.D., Phm.D., Fayetteville, Tenn., Director, Lincoln Health Dept.

William R. Dorr, M.D., Arlington, Calif., Superintendent, Riverside County Hospital

Gordon Hastings, M.D., State Board of Health, Little Rock, Ark., Assistant State Health Officer

Thaddeus C. Kimble, M.D., Ph.D., Miltonvale, Kans., City Health Officer

William P. Lee, Huey Bldg., Cisco, Tex., City Health Officer

Aaron Leifer, M.D., 340 St. Johns Place, Brooklyn, N. Y., Medical Inspector, New York City Dept. of Health

Edward G. McGavran, M.D., Hillsdale, Mich., Director, Hillsdale County Health Dept.

Claud L. Murphree, M.D., Court House, Gadsden, Ala., Etowah County Health Officer

W. H. Smith, Box 216, Hondo, Tex., Medina County Health Officer

Samuel D. Sturkie, M.D., Oneonta, Ala., Blount County Health Officer

Laboratory Section

Kenneth L. Burdon, Ph.D., Washington University School of Medicine, St. Louis, Mo., Instructor in Bacteriology, Immunology, and Public Health

Public Health Engineering Section

Joe C. Behrens, B.S., 4300 Maypole Ave., Chicago, Ill., Sanitary Engineer, City Board of Health

John A. Clark, A.B., 141 Belleview Drive, San Leandro, Calif., Sanitary Engineering Inspector

Eugene F. Schad, B.S., 1046 N. Kedzie Ave., Chicago, Ill., Junior Assistant Sanitary Engineer

Public Health Nursing Section

Alice Austin, R.N., 681 Merrick, Detroit, Mich., Supervisor of Public Health Nurses

Frances A. Barringer, R.N., Court House, Charlotte, Va., County Health Nurse

Martha E. Booher, R.N., 820 Florida Ave., Blountsville, Tenn., Staff Nurse, Sullivan County Health Dept.

Claudia Davidson, R.N., 2902 Belmont Blvd., Nashville, Tenn., Field Nurse

Hazel Fees, Jamestown, Tenn., County Health Nurse

Jean E. Greer, R.N., 3317 White Bldg., Seattle, Wash., Director, Seattle Visiting Nurse Service

Ethel R. Jacobs, Albion, Ind., Noble County Public Health Nurse

Mrs. Pearl L. Maier, R.N., C.P.H., Gladwin, Mich., Public Health Nurse, Children's Fund of Michigan

Evelyn E. Morgan, R.N., Pike County Health Dept., McComb, Miss., Staff Nurse

Anne Pelley, R.N., Batesville, Ark., County Health Nurse

Industrial Hygiene Section

Leroy P. Kuhn, M.D., 4750 Sheridan Rd., Chicago, Ill. (Assoc.)

Food and Nutrition Section

Frederick B. Carter, El Monte, Calif., Manager, Arden Farms, Inc. (Assoc.)

Public Health Education Section

Thomas B. Kirkpatrick, M.A., University Hall, Columbia Univ., New York, N. Y., Teaching Community Hygiene

Epidemiology Section

John S. Cunningham, M.D., La Plata, Md., Deputy State and County Health Officer

Dale McCoy, D.O., Burlington, Kans., Coffey County Health Officer

Katherine A. Nye, M.D., 803 Lowry Medical Arts Bldg., St. Paul, Minn., Medical Inspector, Dept. of Health

Request for Change in Status

Maria W. Bates, 112 Linden Ave., Malden, Mass., formerly Associate Member, is now Health Teacher, Beebe Junior High School, Malden, Mass.

PASADENA SPECIAL

"ALL aboard!" At 9.15 on the evening of August 28, many fortunate members of the A.P.H.A. heard that call. It started the A.P.H.A. Special Train to the Pasadena meeting. Three sleepers left Grand Central Station on one of the most interesting itineraries many of the passengers have ever taken.

To all those aboard the same ideas probably came: Who is taking the trip? In what car are my friends? I wonder whether someone would like to play bridge? These questions were soon answered, and before the train reached Harmon, N. Y., groups had assembled to talk and to discuss matters important to them.

Early in the morning the train reached Buffalo. Some energetic spirits arose to see the station, but their number was not legion. At breakfast one of the most convenient of all arrangements made itself evident—All you had to do to get a delightful meal was to give up one of your tickets in the scrip book turned over to you with your ticket. Why, you could almost imagine that you were receiving a free meal! And, further, you were not troubled with any tipping. All those incidentals were included in the ticket. This scheme has great appeal to anyone who has traveled considerably. It surrounds you with the atmosphere of a private train.

About noon more members joined the Special at Detroit. These were greeted by friends and promptly initiated into the "family."

By now the travelers had settled down. Here you could see one of the Association officers working on a paper; in another section committee members were studying the year's work. These activities were noticed on the entire trip to Pasadena in spite of the scenery passed enroute and the entertainment provided at stops. This speaks well for the diligence of many of our officers and members.

Arriving in Chicago about 5.30 P.M., we were met by Dr. Herman N. Bundesen and some of his staff. In taxicabs the entire party was promptly taken to the Century of Progress Exposition where, in Old Heidelberg, a satisfying dinner was served. This meal was made quite enjoyable by the music—vocal and instrumental—of the costume clad German singers. After dinner, one's time was his own until train departure at 1.00 A.M. Some of the party enjoyed the view from the Sky Ride; others went to see the fine displays of the automobile manufacturers; while it is said that many spent the entire evening in the Streets of Paris.

Leaving Chicago, our Special Train was complete with five sleepers, a diner, a club car, and an observation car. From this point on the train belonged to the A.P.H.A. There were now no "furriners" aboard, and the train officials made it clear that the party was to enjoy itself in the full freedom of the train. (It was reported that two of the party were in the engine when the train was standing at a station.)

From Chicago to the Mississippi River all slept, but bright and early that morning (Thursday) some witnessed the river crossing. At noon we were in Kansas City where a stop of 45 minutes afforded opportunity to see the beautiful station and the impressive war memorial across the plaza from the station.

Leaving Kansas City the route followed the old Santa Fe Trail, passing Newton, Kans., about 7.00 P.M., and Dodge City at bedtime. Early Friday morning the mountains started to fly by the windows. Early risers were well

rewarded by seeing the summit of Raton Range at Raton, N. M., a point 7,622 feet above sea level. About noon the train reached the Pueblo Indian village country. The villages, peculiar to these Indians, were intensely interesting.

At Albuquerque, the party had ample time to visit Fred Harvey's Museum and to rave over the interesting objects he has collected. The beaten silver jewelry with turquoise ornamentation was especially attractive to the ladies, and evidences of some purchases were seen on fingers and wrists after the train left.

On to Gallup! Here took place one of the events of the trip which made a lasting impression on all. The 12th Intertribal Ceremonies were being held and the A.P.H.A. party was privileged to see the last night of it. Many tribes took part, exhibiting such tribal dances as the Eagle Dance, the Crow Dance, and the Fire Dance. What a thrilling episode in the life of those unaccustomed to such exhibitions! The Indian audience watching the dances was just as intriguing as the dancers themselves.

Grand Canyon all day Saturday! This was another of the high spots of the trip. Adequate description is impossible—one must see it. A westward drive to Hermit's Rest occupied the morning. In the afternoon some took the trip to Indian Watch Tower which is to the east along the south rim. This is a beautiful drive and the Watch Tower one of the loveliest pieces of design and construction typifying the Pueblo Indian to be found anywhere. Five members of the party were hardy enough to descend the canyon to the river on muleback. Their tales of "heroism" after returning indicated an enjoyable trip. The Mojave Desert was crossed on Sunday morning. At San Bernardino the party was welcomed with customary California hospitality. A Spanish orchestra was playing at the station; oranges were offered to quench one's thirst; and officials of the city and the Chamber of Commerce greeted the travelers personally.

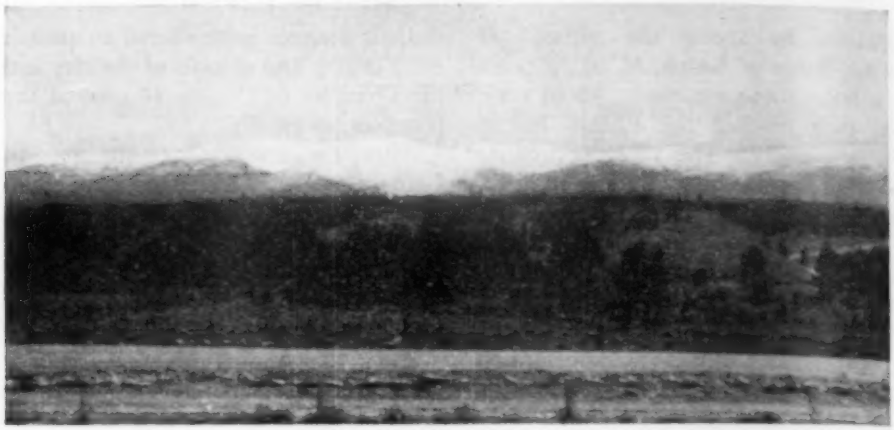
After the cordial greeting at San Bernardino, the Special slipped into Pasadena, where the Local Committee, headed by Dr. Dunshee, welcomed the group of more than 100 and saw to it that each was happily settled for the busy convention ahead.

After the Annual Meeting—a busy and successful one—all were loath to leave. But, after all, the Special did have to depart on schedule and, except for a small party which was able to go to Yosemite National Park through the courtesy of some of the California State Department of Health officials, all were on board Thursday at departure time.

Would the return trip be an interesting one?—This thought occurred to many as they boarded the train. It was needless. The return trip, somewhat like Grand Canyon, cannot be adequately detailed or described. At San Francisco Dr. Geiger was a delightful host; at Stockton and Lodi, Dr. Sippy justified his reputation for entertaining; and at Sacramento Dr. True displayed the true California spirit of hospitality. In all of these four interesting areas instructive and entertaining programs requiring the constant attention of the entire party had been planned and were executed with precision and with pleasure to the participants.

It was only with regrets that the members of the party left California. All of the western members as well as the associations affiliated with the parent organization, fully justified the expectations of the "swell" time forecast for the meeting.

Sunday, after leaving Sacramento, was replete with scenery. Here the mountains, snow-capped because of a recent snowfall; there the flat country and the famous Salt Lake, over which the train travelled for miles. The con-



Rockies from the Train, Colorado

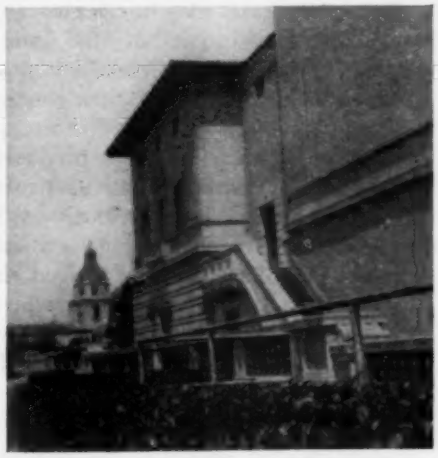
Hassler Home, San Francisco

The Tour Conductors

Leland Stanford Memorial Chapel

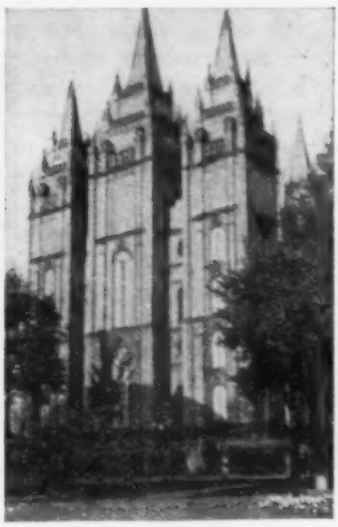
Moffat Tunnel—Near Denver

Lookout Point—Near Denver



Pasadena Convention Hall, City Auditorium

Troubadours of Welcome, San Bernardino



Salt Lake Cathedral

Golden Gate

trast of mountains, flats, and blue water is such as to leave a vivid impression on one's memory.

At Salt Lake City, Dr. Beatty met the Special. A well planned stop-over included a tour of this lovely city situated in the bottom of a natural bowl, a visit to the Tabernacle of the Latter Day Saints, where a special organ recital was given and a dinner under the auspices of the Chamber of Commerce. The thoughts of the individual members of the party will always deal kindly with Salt Lake City, and the gracious residents of that city.

From Salt Lake City to Denver the route displayed some of the most spectacular scenery in America. The Fraser River Canyon, along the Colorado River, up into and through the Moffat Tunnel—all these produced wonderful and characteristic views long to be remembered. Obviously this lovely scenery could not go on interminably. The Special arrived in Denver early Monday afternoon, where Dr. Jaffa and Dr. Beaghler greeted the travelers, promptly arranged for their comfortable transportation to Lookout Mountain, and engineered the last lovely tour of the trip. From the consecrated spot hallowed by the grave of Buffalo Bill, an inspiring view of Golden and of Denver, far in the background, was had. From this vantage point the group twisted and turned down the Lariat Trail, back to Denver and a most welcome and enjoyable dinner.

Knowing that Denver was the last stop-over of the Special Train, the footsteps of the passengers seemed to lag on the way through the station. But after kindly farewells and promises to return, the train moved out, seeking New York, its destination. From Denver to New York was uneventful except for the conversations of the Special party in which the pleasures of the entire trip were discussed and rehearsed from person to person.

All good things must end, and New York saw the close of one of the pleasantest and best planned trips in the Association's history.

" Here Porter, please take my bags."

A. P. M.

All the photographs reproduced here were very kindly supplied by members of the party who snapped them during the trip

NEWS FROM THE FIELD

DELEGATES TO ARGENTINA CONFERENCE

KENDALL EMERSON, M.D., Life Member and Executive Secretary of the A.P.H.A., and Managing Director of the National Tuberculosis Association, will be one of the delegates representing the United States at the Pan-American Sanitary Conference in Buenos Aires, Argentina, November 12–22.

Surgeon-General Hugh S. Cumming, F.A.P.H.A., and B. J. Lloyd, M.D., member A.P.H.A., of the U. S. Public Health Service, will be the other delegates, Dr. Cumming acting as chairman of the delegation. They sailed from New York on October 13.

NATIONAL ADVISORY COUNCIL ON RADIO IN EDUCATION ENTERS PUBLIC HEALTH FIELD

THERE will be 19 programs of 15 minutes each (10:45–11:00 Eastern Standard Time) every Monday evening, from October 2 through February 25—excepting October 27, November 5, and November 12—over a nation-wide network of the Columbia Broadcasting System.

This series of broadcasts will consider the subject of medical economics, the cost of medical care, the relation between the medical profession and the public, and ways of reconciling the interests of the two groups.

All the programs will be published by the University of Chicago Press, 5750 Ellis Avenue, Chicago, and each program will be available shortly after it is broadcast, for $.15 for individual numbers, or $2 for the series of 19.

The Public Health Committee of the National Advisory Council on Radio in Education is headed by William Trufant Foster, Director of the Pollak Foundation, and includes Dr. Haven Emerson, Dr. Alice Hamilton, Dr. Thomas Parran, Jr., Dr. H. S. Cumming, and Dr. Ray Lyman Wilbur. The National Advisory Council on Radio in Education is headed by Robert A. Millikan as President, and Levering Tyson is the Director.

JANUARY 1933 JOURNALS WANTED

READERS of The American Journal of Public Health are asked to send spare copies of the January, 1933, issue to the American Public Health Association, 50 West 50th Street, New York, N. Y., as this issue is out of stock. This will be much appreciated, and reimbursement of postage will be made in each case.

A.S.H.A. WITHDRAWS SPONSORSHIP OF FILM

THE American Social Hygiene Association announces withdrawal of sponsorship of "Damaged Lives," the commercially produced motion picture film they undertook to sponsor a year ago. The Weldon Pictures Corporation, who are the owners of the film, have been asked to remove from the film and all prints thereof and from all advertising, pamphlets, or other material used in connection with future showings, the name of the A.S.H.A. as sponsors.

This action was taken not because of a change in viewpoint as to the value of the film, but because "it has apparently proved impossible for the Weldon Pictures Corporation with its limited organization and commercial affiliations to control undesirable and unauthorized activities of distributors and exhibitors in the local advertising and showings of the films."

HEALTH COUNCIL ESTABLISHED

THE District of Columbia Health and Hospital Council, composed of representatives of medical, dental and civic societies, was recently formed, sponsored by the Council of Social Agencies.

The council will be available to all government authority as a medium of ascertaining opinion and reaction of the majority in professional, administrative and lay organizations representing the citizens in the district, it is stated.

CALIFORNIA A.W.W.A. CONVENTION HELD

THE California Section of the American Water Works Association held its 1934 Convention at Long Beach, Calif., October 24–27.

PERSONALS

PAUL F. RUSSELL, M.D., member A.P.H.A., of the Bureau of Science in Manila, P. I., announces that he has been assigned to work in India, at Kasauli, Punjab. His mail address, for the present, is the All-India Institute of Hygiene, 21 Central Avenue, Calcutta, India.

DR. JOSEPH C. KNOX, Assistant Epidemiologist of the North Carolina State Board of Health, Raleigh, N. C., has been appointed Epidemiologist, succeeding Dr. Daniel F. Milam, member A.P.H.A., who has been transferred to Panama by the International Health Board of the Rockefeller Foundation. He was assigned as consulting epidemiologist to North Carolina 2 years ago. Dr. Robert E. Fox, member A.P.H.A., of Boston, formerly Health Officer of Buncombe County, has been made Assistant Director of County Health Work.

DR. NOLTON N. ASHLEY has been appointed Health Officer of Oakland, Calif., succeeding Arthur Hieronymus, M.D., member A.P.H.A.

DR. STANLEY R. PARKINSON, of Marysville, Calif., has succeeded Dr. James H. Barr as Health Officer of Yuba County.

DR. DENVER D. ROOS has been appointed Health Officer of Corona, Calif., following the retirement of Dr. William S. Davis.

JACOB J. GOLUB, M.D., member A.P.H.A., sailed for Europe July 5 on his way to spend 2 months as consultant to the Hebrew University in Palestine in connection with the building of the Hebrew University Hospital in Jerusalem.

JOHN O. MCREYNOLDS, M.D., associate member A.P.H.A., of Dallas, Tex., recently had the Venezuelan medal of honor conferred on him in recognition of his services to the cause of education "as a mark of the gratitude of the people of Venezuela."

WARREN F. DRAPER, M.D., F.A.P.H.A., of Richmond, Va., Assistant Surgeon General of the U. S. Public Health Service, resigned, and will be succeeded by Dr. I. C. Riggin, F.A.P.H.A., also of Richmond.

CONFERENCES

Nov. 2, Mid-Year Meeting of the New York State Association of Public Health Laboratories, at the State Laboratory, Albany, N. Y.

Nov. 8–10, Missouri Valley Section, American Water Works Association, Omaha, Neb.

Nov. 12–22, Pan-American Sanitary Conference, Buenos Aires, Argentina.

Nov. 12–14, North Carolina Section, American Water Works Association, Elizabeth City, N. C.

Nov. 13–16, Southern Medical Association, San Antonio, Tex.

Nov. 16, 17, 60th Anniversary Meeting, New Jersey Health and Sanitary Association, Berkeley-Carteret Hotel, Asbury Park, N. J.

Dec. 6–8, Annual Meeting, National Society for the Prevention of Blindness, New York, N. Y.